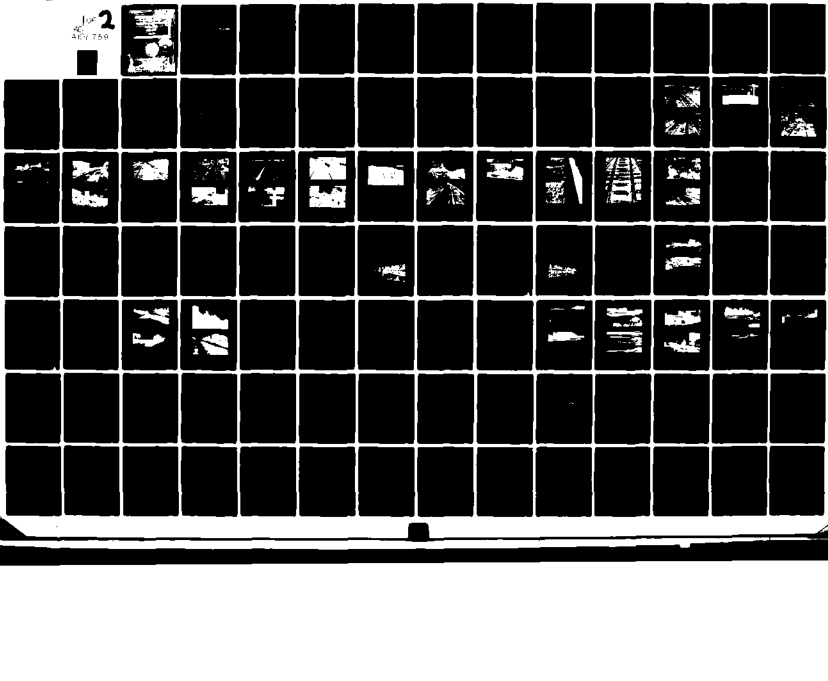
AD-A101 759   MILITARY TRAFFIC MANAGEMENT COMMAND TRANSPORTATION EN--ETC   F/G 15/5
RAIL AND MOTOR OUTLOADING CAPABILITY STUDY, FORT DRUM, NEW YORK--ETC(U)
JUN 79   T K WONG, J H GRIER
UNCLASSIFIED   MTMC-TE-78-4-55   SBIE-AD-E750 080   NL

1 OF 2
AD
A101 759



AD A101759

MTMC REPORT TE 78-4-55

RAIL AND MOTOR OUTLOADING CAPABILITY STUDY

FORT DRUM, NEW YORK

June 1979

Project Engineers

Terrence K. H. Wong, CPT, TC, USA
John H. Grier, PE
Traffic Engineering Division

MILITARY TRAFFIC MANAGEMENT COMMAND
TRANSPORTATION ENGINEERING AGENCY
Newport News, Virginia 23606

TABLE OF CONTENTS

TABLE OF CONTENTS - cont

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS - cont

LIST OF ILLUSTRATIONS - cont

LIST OF TABLES

EXECUTIVE SUMMARY

1. SCOPE

The Military Traffic Management Command (MTMC) conducted a survey of the rail and motor facilities at Fort Drum, New York, from 7 through 10 August 1978, to determine the installation's outloading capability. Rail facilities within 25 miles of Fort Drum were included in the survey.

2. FINDINGS

The primary finding is that Fort Drum has the potential capability to support relatively large-scale rail outloading operations.

To transport the equipment of the mobilized armored division and support-type units entirely by rail would require 3,427 railcars, with an estimated composition of 3,288 flatcars (1,367 containing roadable and 1,921 containing nonroadable equipment) and 139 boxcars[1/]. Since the installation outloading plans were incomplete and no time frame had been established for unit outloading, the analyses in this report are based on a 10-day outloading operation (all equipment, and also the nonroadable only). During the outloading period five railcar loads of nonroadable equipment are scheduled to arrive. The equipment of these arriving units can be handled without interfering in the outloading operation.

Fort Drum has approximately 15 miles of railroad track. The majority of the rail trackage is classified as Class 2, according to federal track safety standards. Certain sections of the rail trackage are classified as less than Class 1 and need to be upgraded to Class 2. There are rail facilities in Watertown, New York, about 12 miles from Fort Drum, that would be suitable to support Fort Drum's outloading.

The current rail outloading capability at Fort Drum is limited by the lack of additional rail end-loading ramps, sections of tracks that are less than Class 1, and shortages of small handtools, bridgeplates,

---

[1/] Since most flatcars are 57 feet long (coupler to coupler), that length is used in this report; to convert to any other length, simply multiply the number of cars by 57 and divide by the desired length in feet.

and blocking and bracing materials. Also needed for maximum efficient outloading operations are adequately trained blocking and bracing crews as well as completed outloading plans.

The recommended rail outloading plan, Plan 6, would yield 344 railcar loads per 24-hour period (269 from Fort Drum and 75 from Watertown). Other options, producing 56, 108, 144, 192, 269 (all equipment), and 205 (nonroadable equipment only) railcar loads, are presented in this study, but Plan 6 satisfies the requirement to outload the division and supporting units within approximately 10 days (assuming that 344 empty railcars, mostly flatcars, could be accumulated on a daily basis).

However, no outloading plan will be successful if the loaded trains cannot proceed out of the area to the main rail arteries. Currently, main line trackage in the area is classified as Class 1, and train time to the east coast is estimated to be 3 days. These main line tracks need to be upgraded to be reliable and insure mobilization readiness.

A survey of loading ramps and other equipment suitable for loading semitrailers revealed that, although the actual availability of semitrailers cannot be predetermined, the motor outloading capability of Fort Drum exceeds the probable supply of available commercial trailers.

Table 1 shows the current and potential outloading capabilities (both rail and motor) of Fort Drum.

3. CONCLUSIONS

a. The condition of main line trackage in the vicinity will constrain any outloading operation, since much of the track is classified as Class 1 (estimated train time, Fort Drum to Bayonne - 3 days).

b. Most of Fort Drum's railroad trackage is classified as Class 2[2/], according to federal track safety standards. Certain sections of the rail trackage are classified as less than Class 1, mainly due to deteriorated ties.

[2/] AR 420-72, 24 March 1976, Surfaced Areas, Railroads, and Associated Structures, para 3-15a, states that track on military installations will be maintained to the minimum track safety standards required for Class 2 as outlined in the current Department of Transportation Federal Railway Administration Track Safety Standards (app A).

TABLE 1
RAIL AND MOTOR OUTLOADING CAPABILITY

Rail				
	Number and Type of Railcars (57-ft Length, Coupler-to-Coupler)			
Rate	Flatcars	Boxcars	Total Outloading	Current Constraints
Daily Current	32	14	46	
Daily Mobilize	96	36	138	Lack of blocking and bracing materials, small handtools, bridgeplates, outloading plans, trained blocking and bracing crews, end-loading ramps, and railcar availability.[a]
Plan 6	329[b]	15	344[b]	Same--($25,000 for 10 timber end ramps
Plan 7 (nonroadable equipment only)	205		205	Same--($10,000 for 4 timber end ramps)

Motor				
	Number of Trailers at Available Facilities			
Rate	Flats	Van Semi-trailers	Total Outloading	Current Constraints
Daily Current:				
Concurrent (with rail operation)	39	55	94	
Separate (without rail operation)	40	68	108	
Daily Mobilize:				The probability of obtaining this number of flatbed and van semitrailers on a daily basis is remote.
Concurrent (with rail operation)	100[c]	100	200	
Separate (without rail operation)	210[d]	100	310	

a/Blocking and bracing materials not stocked.
b/Includes 75 flatcars outloaded at the CONRAIL Watertown facility.
c/With existing usable end-loading ramps and equipment suitable for end-loading semitrailers.
d/Using all of c above plus all potential rail end-loading ramps.

c. The primary constraints limiting Fort Drum's rail outloading capability are the shortage of blocking and bracing materials, small handtools, bridgeplates, trained blocking and bracing crews, and a lack of outloading plans.

d. End-loading ramps are needed for the six additional identified loading sites.

e. After the deficiencies noted above are corrected and upon receipt of sufficient railcars to permit full-scale outloading, Fort Drum could achieve an outloading/receiving rate of 269 railcars per 24-hour period. At this rate, the division could be outloaded in 10 days. However, support-type units to be deployed during the same time frame will need to be outloaded (75 railcars per 24-hour period) at Watertown, New York, because Fort Drum's facilities will be fully utilized.

f. No costs for track repairs are indicated since Fort Drum's yearly track maintenance program for FY 79 should be adequate to replace decayed ties and upgrade those sections of track to Class 2. Costs for needed handtools, bridgeplates, and blocking and bracing material would be additional.

g. Empty railcars (dedicated train lengths) destined for Fort Drum should be positioned in train-loading sequence in Watertown.

h. The Consolidated Rail Corporation (CONRAIL) representatives did not express any reservations regarding the outloading of Fort Drum units. However, Fort Drum's transportation personnel should coordinate planning of impending outloading operations with the CONRAIL representatives at the earliest possible date.

i. For administrative-type moves, when leadtime is plentiful and costs must be considered, special-purpose railcars (such as bi-level autoracks, trailer-on-flatcar (TOFC), and container-on-flatcar (COFC cars) are more cost-effective than the standard types and should be used to the extent they are available.

j. For mobilization moves, when time is more critical than cost, the use of special-purpose railcars may not be possible because of the short leadtime and relatively short supply of these high-demand cars.

k. Motor outloading is not a good alternative to rail at Fort Drum due to the large number of nonroadable vehicles (1,921 railcar loads) that must be outloaded and lack of motor capability in the area.

l. For concurrent rail and motor operations, 100 flatbed and 100 van semitrailers could be loaded per 10-hour day (for daylight operations only), and for separate operations, 210 flatbed and 100 van semitrailers could be loaded during the same period. This capability exceeds the probable local available supply of semitrailers.

m. The maximum curvature of the railroad tracks is 8 degrees. Consequently, any known length of railcar can be used on the installation.

4. RECOMMENDATIONS

a. Upgrade the CONRAIL main line track to the east coast to a minimum of Class 2 to reduce the probability of derailments and to insure a more reliable response for mobilization readiness.

b. Undertake those items listed in section II, paragraph D4, "Physical Improvements and Additions." These improvements will provide a rail system capability of 269 railcars per 24-hour day as well as an effective rail system.

c. Prepare a detailed unit outloading plan, using the simulation in appendix B as an example, that specifies unit assignments at loadout sites and movement functions.

d. Coordinate rail outloading plans with CONRAIL representatives at the earliest possible date.

e. Continue rail facility maintenance to insure an effective rail system.

f. Provide advance training for blocking and bracing crews.

g. Station road guards at all railroad crossings during outloading operations, and provide all train crewmen with walkie-talkies to insure a safer and more efficient operation.

h. Keep abreast of CONRAIL railroad maintenance plans.

i. Use special-purpose railcars (such as bilevel autoracks for small vehicles, TOFC cars for semitrailers and vans, and COFC cars for MILVANs) for administrative-type moves and, as available, for mobilization moves.

j. Provide warehousing for the blocking, bracing, and small tool supplies.

k. Coordinate with MTMC any removal of railroad track that is included in the mobilization outloading plan.

l. Construct any new track with a maximum curvature of 12 degrees.

I. INTRODUCTION

An onsite rail and motor outloading study of Fort Drum, New York (fig 1), was conducted by the Military Traffic Management Command Transportation Engineering Agency, Newport News, Virginia, during the period 7 through 10 August 1978. The principal objective of the study was to determine the capability of the Fort Drum rail system to support the deployment of a mobilized armored division and support-type units. Another objective was to identify any physical improvement, as well as any suitable commercial rail facilities, within Watertown, New York, which would significantly increase the current capability. This study includes the findings of a Federal Railway Administration (FRA) inspector, who inspected all trackage at Fort Drum during the period 15 to 16 August 1978.

The current rail outloading capability of Fort Drum is limited by a lack of outloading plans, adequate blocking and bracing materials and small handtools, adequately trained blocking and bracing crews, and sufficient additional end-loading ramps. Also limiting the current rail outloading capability is the condition of installation rail trackage, sections of which are classified as being less than Class 2, and the main line trackage, which is marginal. The analysis in this study showed that, if these deficiencies were corrected and rail trackage upgraded to Class 2, Fort Drum could support an outloading rate of 269 railcars (daily mobilize) per 24-hour day. At this rate, the armored division could be outloaded in approximately 10 days. However, support-type units that are outloading during the same time frame as the division could not be outloaded from Fort Drum, as its rail facilities would be fully utilized. Outloading support from the CONRAIL facilities at Watertown will be required at an outloading rate of 75 railcars (daily mobilize) per 24-hour day. With this combined rate, all units required to outload during the peak period could be accommodated. This study considers options that could produce 56, 108, 144, 192, 269, or 344 railcar loads per 24-hour period and recommends the one with the 344 yield (Plan 6).

Fort Drum is served by the Consolidated Rail Corporation (CONRAIL). A large CONRAIL classification yard is located in Watertown, New York. Motor outloading capability is a consideration because Fort Drum is approximately 325 miles from a suitable east coast port of embarkation (POE). This study analyses the worst case--that of an all-rail movement to a distant POE. Should portions of the division, or support units, travel by road to the POE, the railcar requirements for rail outloading will decrease accordingly. Findings and recommendations contained in this report are based on analysis of data obtained during the field survey and on

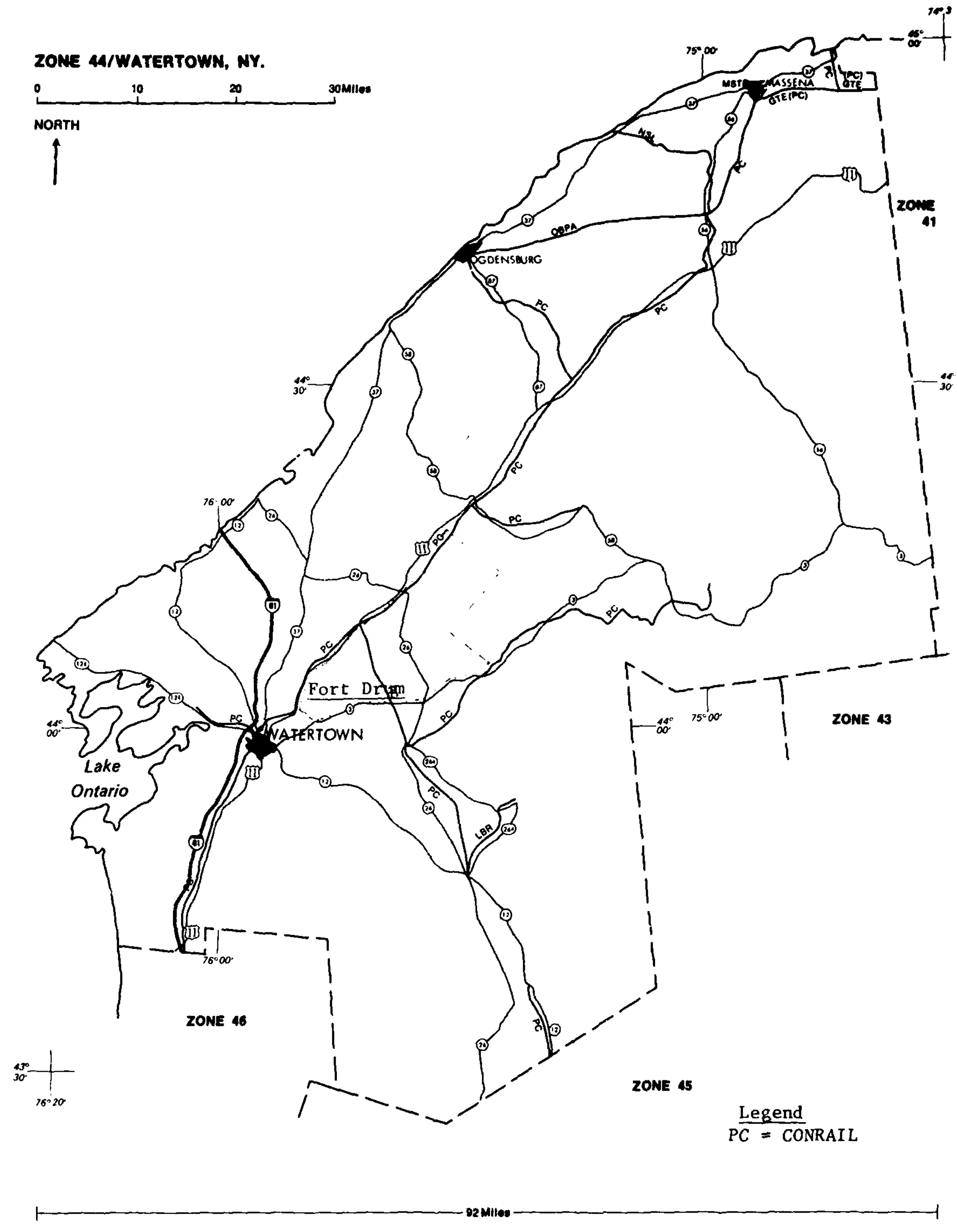


Figure 1. Fort Drum and vicinity (reproduced from US Transportation Zone Maps, Department of Transportation, October 1975).

other pertinent information relating to installation activities at that time. Any problems incurred in implementing the recommendations should be referred to MTMCTEA for resolution.

Mail address is:	Director Military Traffic Management Command Transportation Engineering Agency ATTN: MTT-TE PO Box 6276 Newport News, VA 23606
Telephone:	AUTOVON 927-4641

II. ANALYSIS OF FORT DRUM'S RAIL OUTLOADING FACILITIES

A. GENERAL

Discussions with personnel of the Transportation Office at Fort Drum revealed that large-scale rail operations have not occurred there in recent years. During training periods there is some small-scale train activity. It was indicated that Fort Drum during nontraining periods has no rail capabilities, due to the closing of the railhead. This closure, generally from 1 December to 15 April, is due to the severe weather conditions and the extremely high cost of clearing and maintaining trackage during the winter months. CONRAIL provides switching services, as Fort Drum has no switch engine or railcrews. Factual data about locomotive operating times and blocking and bracing capabilities were gathered from previous studies.

B. RAIL FACILITY DESCRIPTION

The Fort Drum rail system, consisting of approximately 15 miles of track, is illustrated in figure 2 and described in table 2. The survey of all sites that could be used for outloading equipment revealed that currently four sites are usable for end-loading vehicles, five sites have side-loading facilities, and six other sites require end-loading ramps and some track modification.

Most railroad trackage at Fort Drum is considered as meeting Federal Railway Class 2 standards, except for a few sections of track that are less than Class 1; they need to have decayed ties replaced, and some sections need replacement of hardware. Fort Drum has a yearly rail maintenance program to keep the track up to Class 2 standards, and this year (FY 79) it is scheduled to repair the present concrete/gravel end-loading ramps.

The following describes in detail the installation sites recommended for loading and for storage of loaded and empty railcars at Fort Drum. The proposed loading sites, in descending order of preference, starting with L1 through L14, are:

<u>Tracks 2, 3, 4, and 5 (L1, L2, L3, and L4)</u> are 29-, 27-, 26-, and 26-railcar-capacity spurs, respectively, with a large concrete/gravel end-loading ramp (figs 3 and 4). The ramp, although usable, currently needs rehabilitation (scheduled to be repaired in FY 79). Track L4, as illustrated, also has a 2-car-capacity side ramp. Large staging areas and motor parks in the vicinity of these tracks (fig 5) are more than adequate to support the outloading operation.

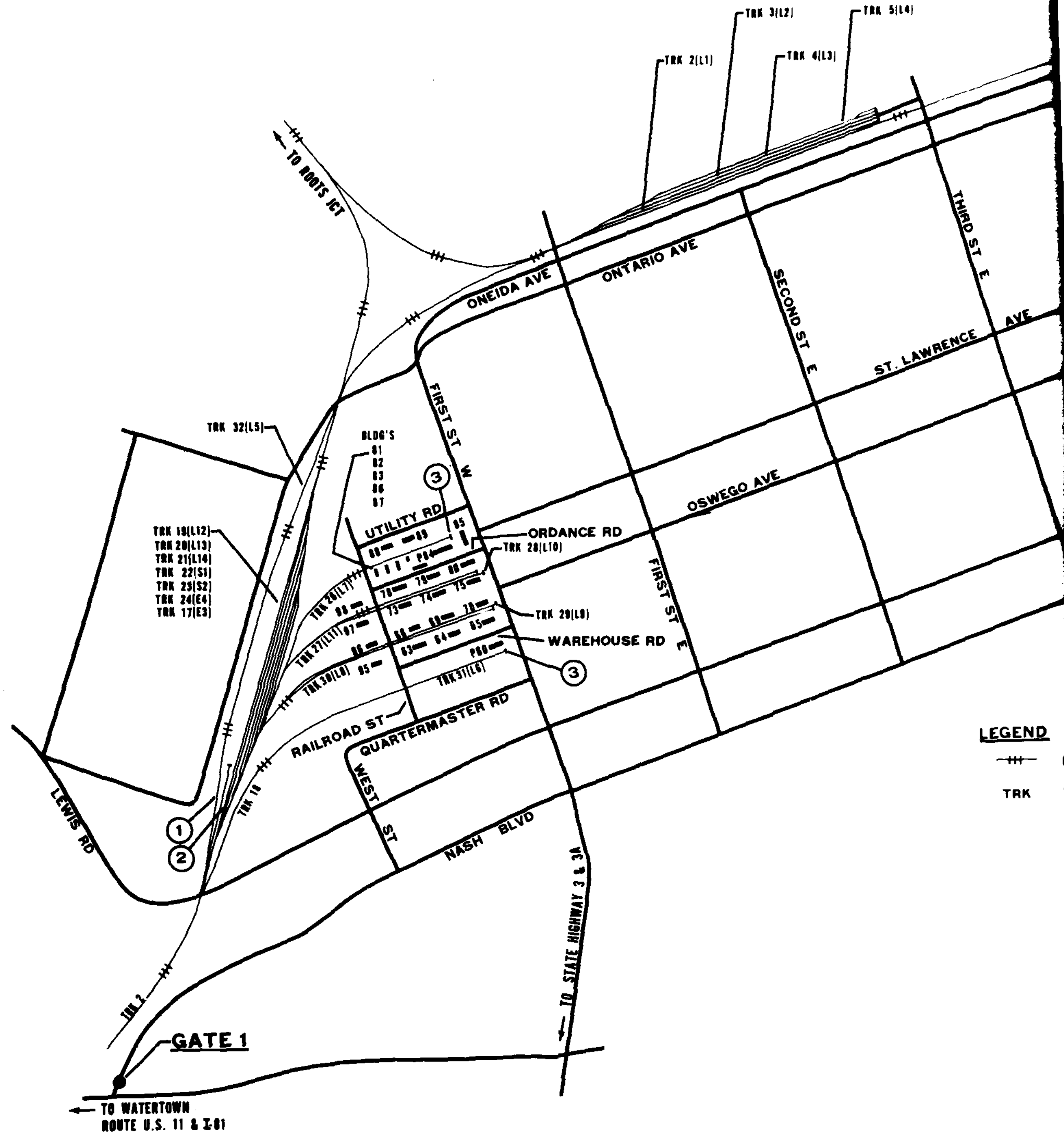
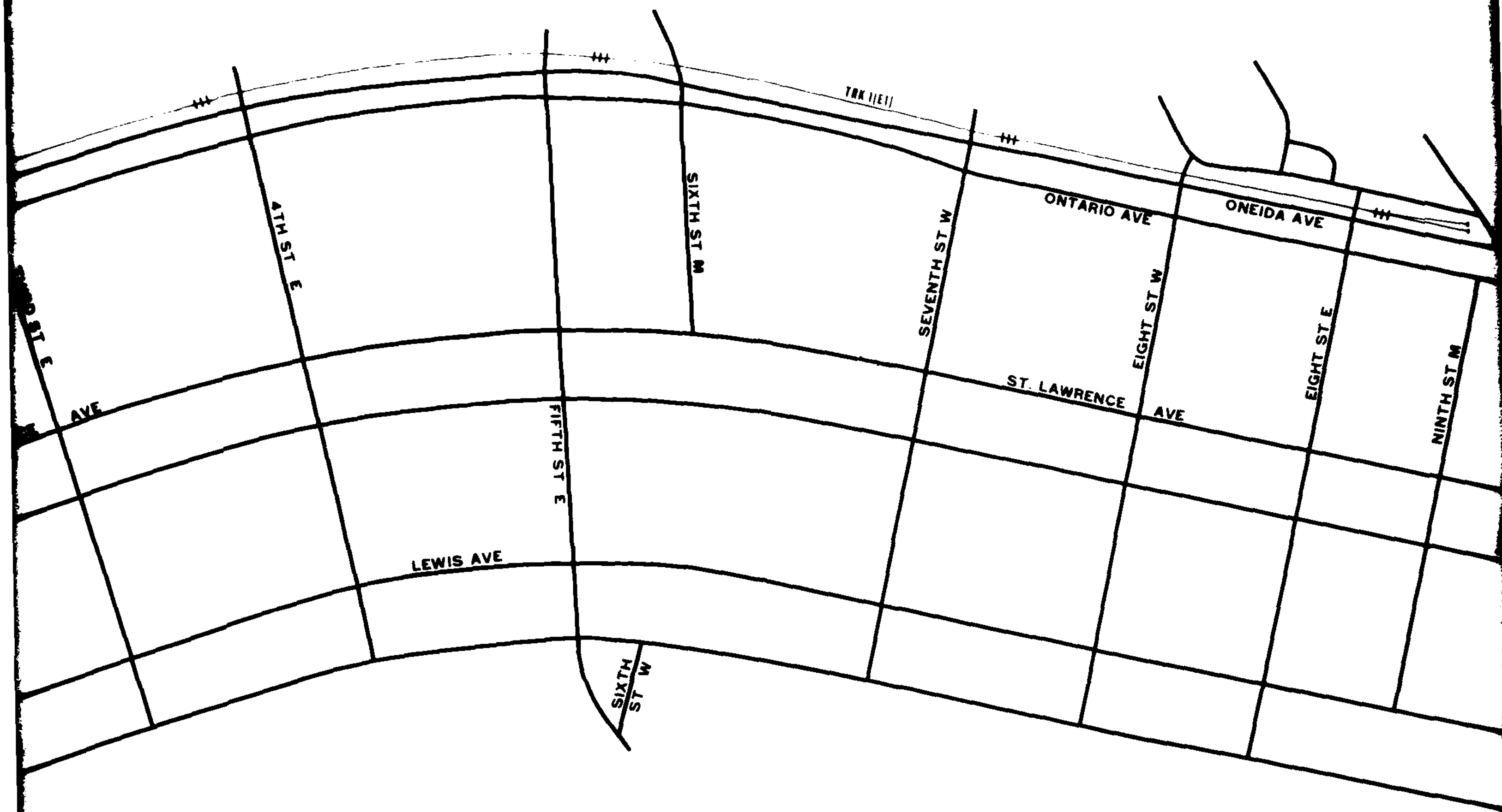


Figure 2. Fort Drum rail system.



LEGEND

—+++—	RAILROAD
TRK	TRACK

NOTES

1. STRAIGHTEN TRACK 32 AND CONSTRUCT TEMPORARY OR PERMANENT END LOADING RAMP AT SOUTH END
2. CONSTRUCT TEMPORARY OR PERMANENT END LOADING RAMP AT SOUTH END OF TRACKS 19, 20 & 21
3. CONSTRUCT TEMPORARY OR PERMANENT END LOADING RAMP

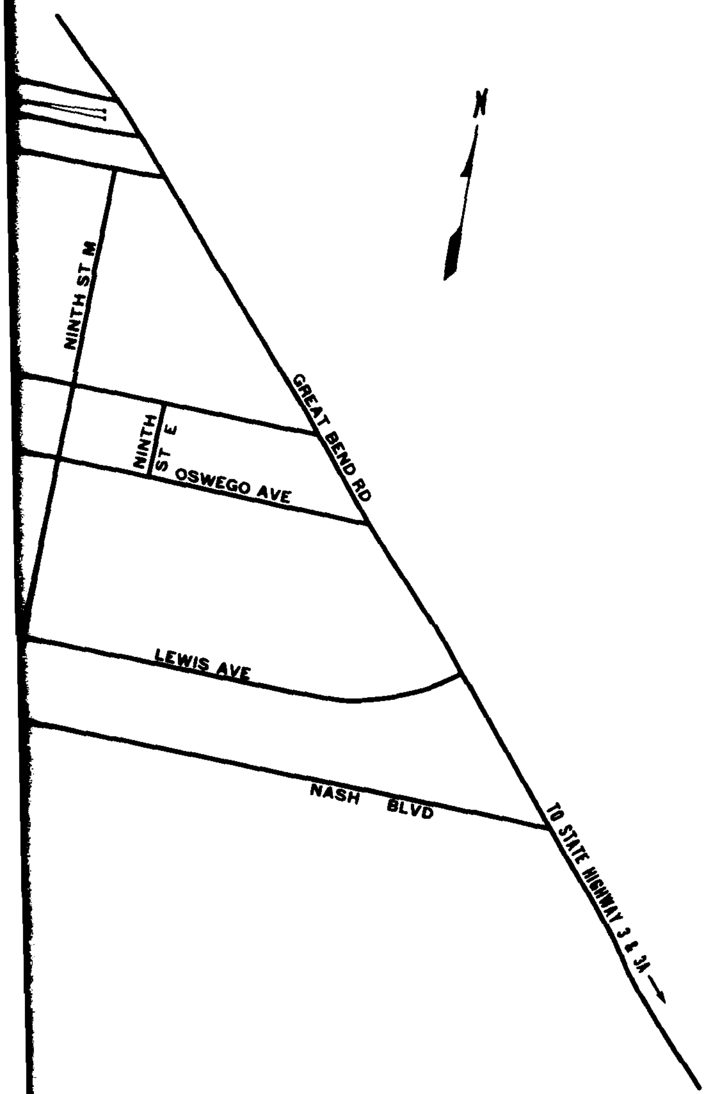

N
NINTH ST W
GREAT BEND RD
NINTH ST E
OSWEGO AVE
LEWIS AVE
NASH BLVD
TO STATE HIGHWAY 3 & 3A

TABLE 2
FORT DRUM RAIL OUTLOADING FACILITIES

Track and Figure Number	End Ramp	Lighting	Surface Conditions	Staging Area	Railcar Capacity Feet	Cars	Access Availability	*Track Condition	Priority	Note
L1 L2 L3 L4 (figs 3 and 4)	Yes, concrete/ gravel with L4 having additional side ramp. Ramps to be rebuilt FY 79.	No	Good, gravel/ sand, needs ballast in certain areas	Yes	1,695 1,592 1,490 1,492	29 27 26 26	Good	Class 2, some tie replacement necessary	1 of 6	Tracked or wheeled vehicle loading with staging areas close by.
L5 (fig 6)	No	No	ditto	Yes	2,625	36	Good	Class 1, some tie replacement necessary, one broken rail needs to be replaced	2 of 6	With construction of a fixed end ramp, track modifications and large staging area close by, will provide longest loading track for tracked or wheeled vehicles
L6 (fig 7)	No	No	ditto	Yes, within short distance	2,421	18	Good	Class 1, some tie replacement and weed control necessary	3 of 6	May be used for end loading with placement of end loading ramp
L7 (fig 8)	No	No	Good, gravel/ sand, needs ballast in certain areas	Yes, within short distance	1,207	15	Good	Class 1, some tie replacement necessary	4 of 6	May be used for end loading with placement of end loading ramp
L8 (fig 9) L9 (fig 9) L10 (fig 10) L11 (fig 10)	No, side ramps	No	ditto	Warehouse storage	1,107 1,500 997 1,385	18 18 17 17	Good	Class 2, some tie replacement necessary	5 of 6	Warehouses and side loading ramps are available for boxcar loading
L12 Classification L13 yard tracks L14 (fig 11)	No	No	ditto	Yes	1,875 1,667 1,459	28 26 23	Good	ditto	6 of 6	Modifying the trackage and using an end loading ramp, these tracks may be used for end loading

*See footnote at end of table.

TABLE 2 - cont

Track and Figure Number	End Ramp	Lighting	Surface Conditions	Staging Area	Railcar Capacity Feet	Railcar Capacity Cars	Access Availability	*Track Condition	Priority	Note
E1 (figs 12, 13, 14 and 15)	No	No	ditto	Yes, large areas along entire track	9,851	170	Good	ditto	1 of 4	Used for temporary storage of empties. Far end of track used for fuel car storage
E2 (fig 16 and 17)	No	No	Good	None	10,000	NA	Limited	Class 2	2 of 4	Used for temporary storage of empties
E3 (fig 18)	No	No	Good, gravel/ sand, needs ballast in certain areas	Yes	900	10	Good	Class 2, some tie replacement necessary	3 of 4	Ladder track, used for temporary storage and/or transit
E4 (fig 18)	No	No	Good, gravel/ sand, needs ballast in certain areas	Yes	942	16	Good	Class 2, some tie replacement necessary	4 of 4	Used for temporary storage and/or transit
S1 (fig 18)	No	No	ditto	Yes	1,256	22	Good	ditto	1 of 3	Used for temporary storage of loaded cars
S2 (fig 18)	No	No	ditto	Yes	1,045	18	Good	ditto	2 of 3	Used for temporary storage of loaded cars
S3 (fig 16)	No	No	ditto	No	18,480		Limited	ditto	3 of 3	Used for temporary storage of loaded/ empty cars

*Indicates track condition based on a general inspection, not a detailed inspection of all track components, which might result in a lower classification of the track. See the FRA report for more detail.

Figure 3. Tracks 5, 4, 3, 2, and 1 (left to right) (looking northeast). Loading ramp in background.

Figure 4. Tracks 1, 2, 3, 4, and 5 (left to right) (looking southwest).

Figure 5. Typical staging area/motor park paralleling entire length of track 1 along Oneida and Ontario Avenues.

Track 32 (L5), as shown in figure 6, is a long ladder track located next to large, motor vehicle park and service areas. Construction of a concrete end-loading ramp at the south end of the track and conversion of the ladder track to a spur track of at least 36-railcar-capacity would make this an ideal loading site. In the interim, a temporary or portable end-loading ramp would suffice.

Track 31 (L6) is located along the southeast side of Building P60 (cold storage warehouse). This 18-railcar-capacity spur can be used for loading/unloading vehicles if a concrete end ramp is built or a portable ramp is installed (fig 7). Surface conditions require additional ballast and weed control.

Track 26 (L7) is located between Utility and Ordnance Roads. There are side-loading ramps along the northwest side of the track and warehouses along the southeast side. This 15-railcar-capacity spur can be used for vehicle loadings if a concrete end ramp is built or a portable ramp is installed (fig 8).

Tracks 30 and 29 (L8 and L9) are located between Oswego and Warehouse Roads. Warehouses and side-loading ramps are located alongside both sets of tracks (fig 9). These spur tracks (18-railcar-capacity each) are ideal for loading general cargo in boxcars and are

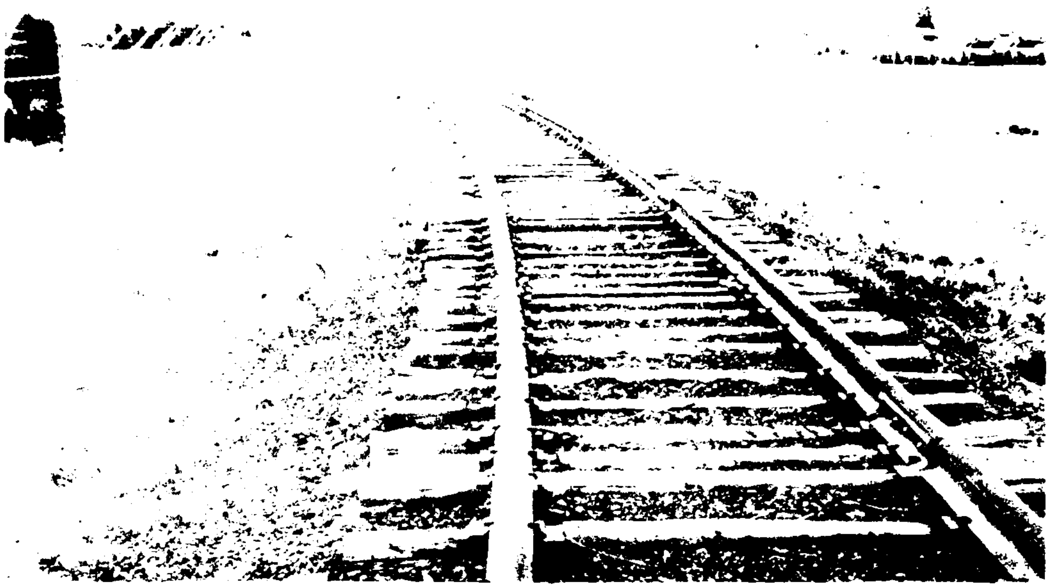


Figure 6. Track 32 (looking south), with vehicle staging areas on left and right.

Figure 7. Track 31 (looking northeast).

Figure 8. Track 26 (looking northeast).

identified as boxcar-loading sites in the recommended outloading operation. Portable or permanent end ramps placed at the northeast end of these spur tracks would allow end loading of vehicles.

Tracks 28 and 27 (L10 and 11) are located between Oswego and Ordnance Roads. Warehouses and side-loading ramps are located alongside both sets of tracks (fig 10). These spur tracks (17-railcar-capacity each) are ideal for loading general cargo in boxcars and are identified as boxcar-loading sites in the recommended outloading operation. Portable or permanent end ramps placed at the northeast end of these spur tracks would allow end loading of vehicles.

Tracks 19, 20, and 21 (L12, L13, and L14) are interchange yard tracks (fig 11). Converting these tracks to spur tracks and constructing concrete end ramps or placing portable ramps will allow L12, L13, and L14 to be used for vehicle loadings. The railcar capacities of these tracks upon completion of modification would be 28, 28, and 23 railcars for L12, L13, and L14, respectively.

Figure 9. Tracks 29 (left) and 30 (right) (looking northeast).

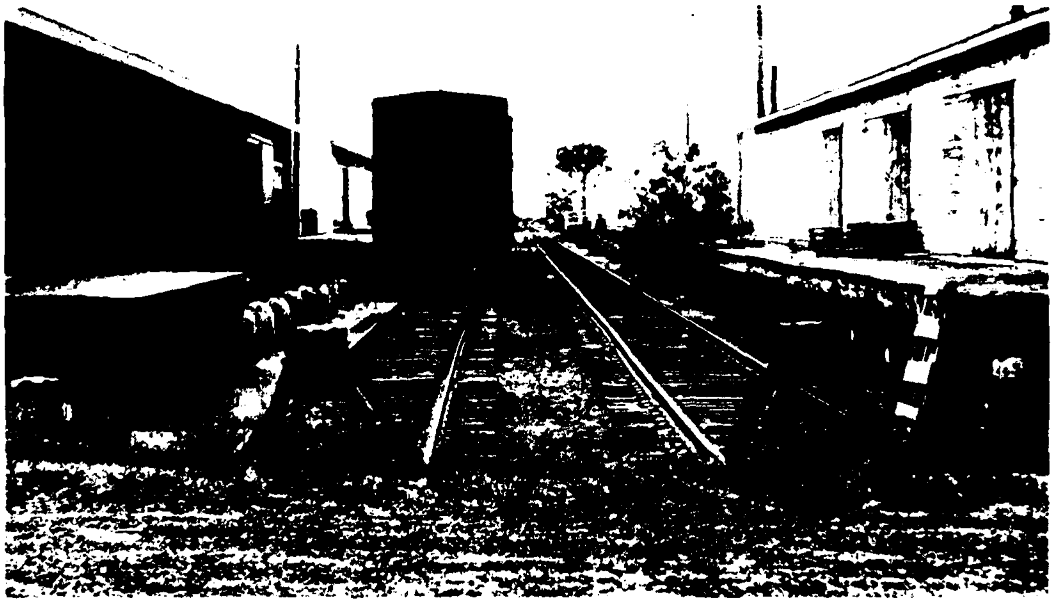


Figure 10. Tracks 28 (left) and 27 (right) (looking southwest).

Figure 11. Fort Drum interchange yard (tracks 17, 24, 23, 22, 21, 20, and 19 (left to right)) (looking south).

Certain tracks have been designated for empty railcar storage or for loaded storage sites and have been assigned a sequence rating. Tracks E1, E2, E3, and E4 are recommended for empty storage. Tracks S1 and S2 are recommended for loaded storage. The following is a discussion of the storage tracks:

Track 1 (E1) is the longest track on Fort Drum and is suitable for storing empty railcars (figs 12 and 13). Fuel tank cars are stored at the far east end of the track, closest to the airfield (fig 14). E1 has a 164-railcar capacity. Large staging areas are located south of and along the entire length of E1 (fig 15).

The CONRAIL main line (E2) is approximately 3-1/2 miles from the Fort Drum wye. A wye (south) track leads from the CONRAIL main line track to Fort Drum (fig 16). The main line may be used for temporary storage of empties. The north portion of the CONRAIL wye (fig 17) is not connected to the main line. Connection to the main line would allow trains to reverse into Fort Drum, which currently trains cannot do.

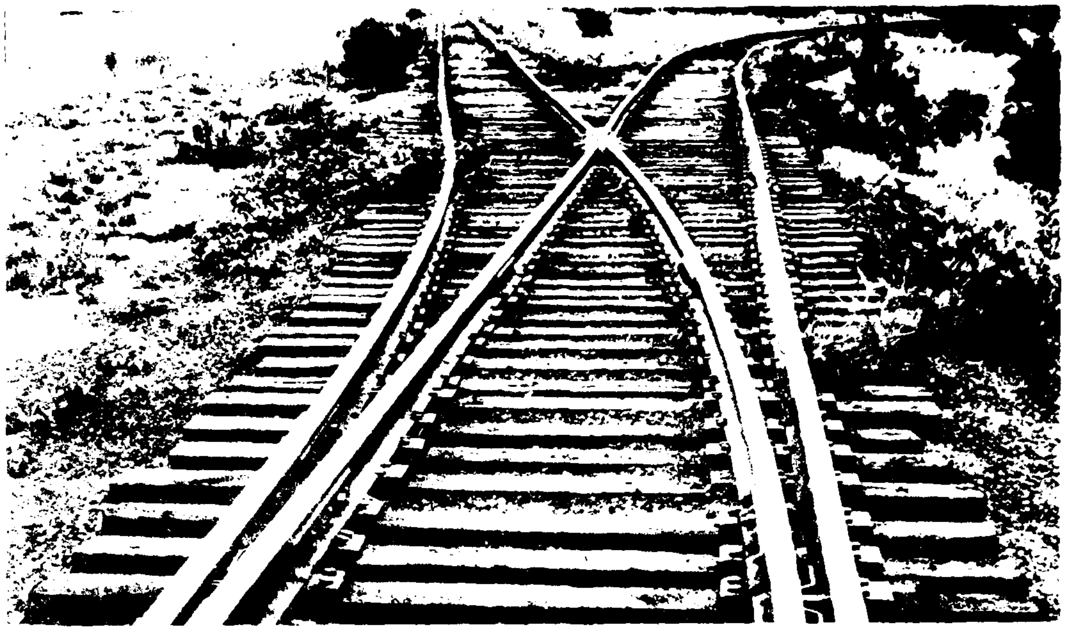


Figure 12. Fort Drum wye (looking west). Left track leads to interchange yard. Right track leads to CONRAIL main line. Track in foreground is start of track 1.

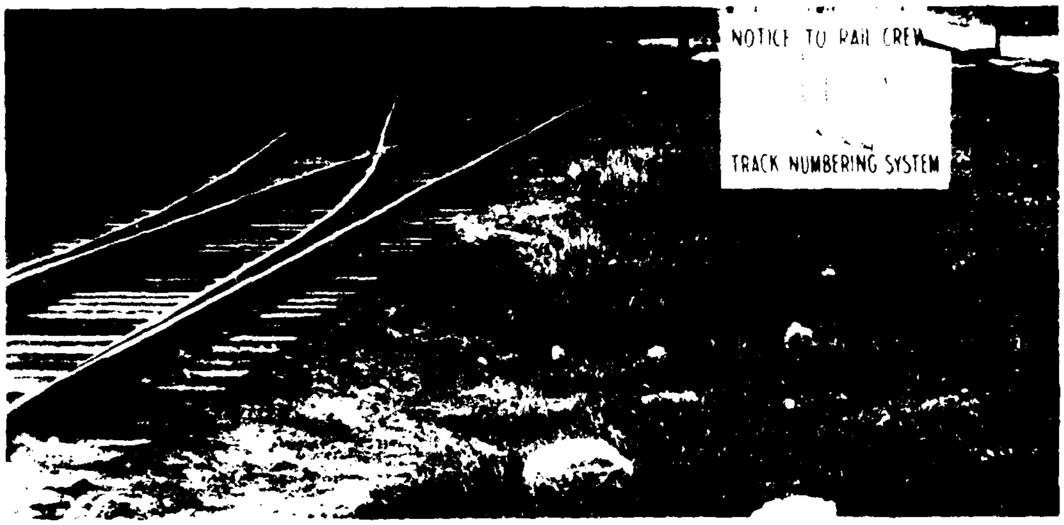


Figure 13. Start of track 1 and track leading to tracks 2, 3, 4, and 5.

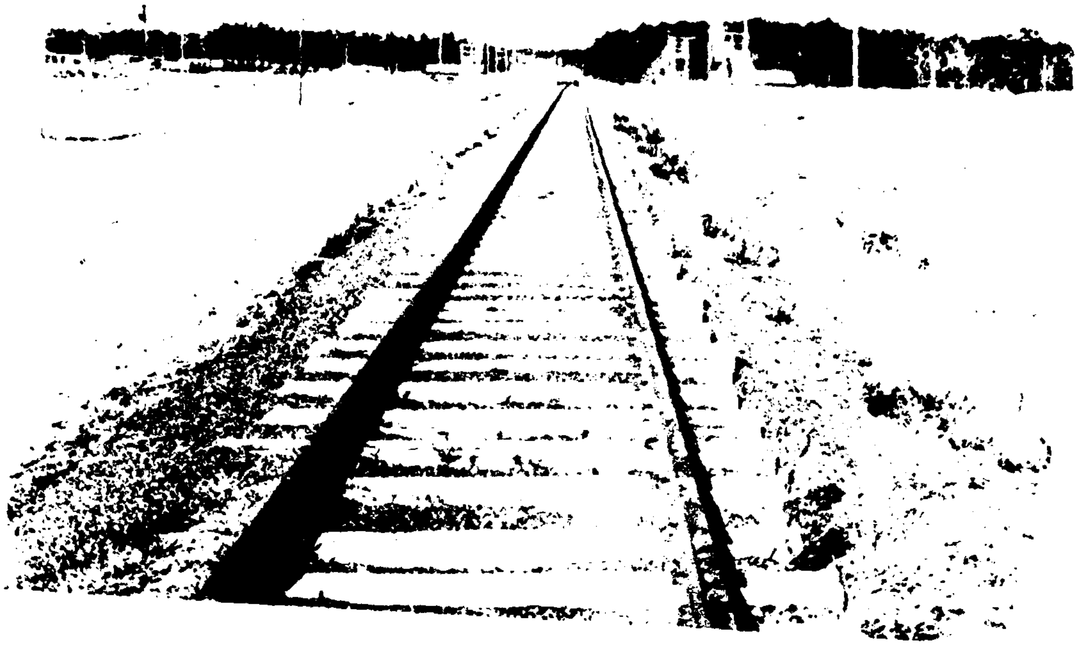


Figure 14. East end of track 1 (looking west).

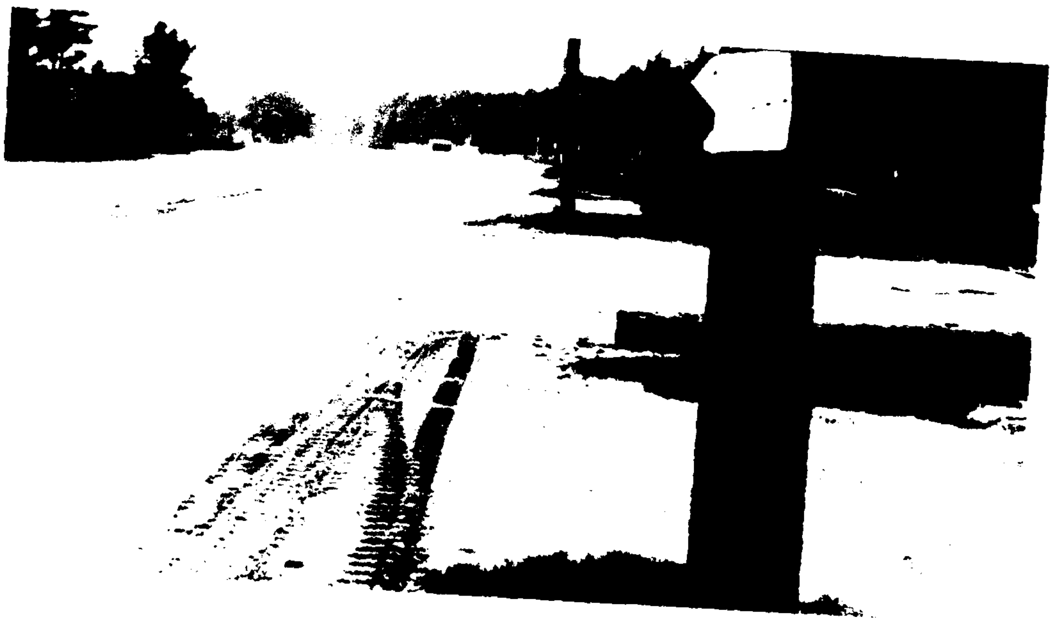


Figure 15. Oneida and Ontario Avenues (looking west). Track 1 parallels these roads on the right.

Figure 16. Wye track (foreground) branching from the CONRAIL main line toward Fort Drum. Fort Drum's wye is 3.5 miles from this point.

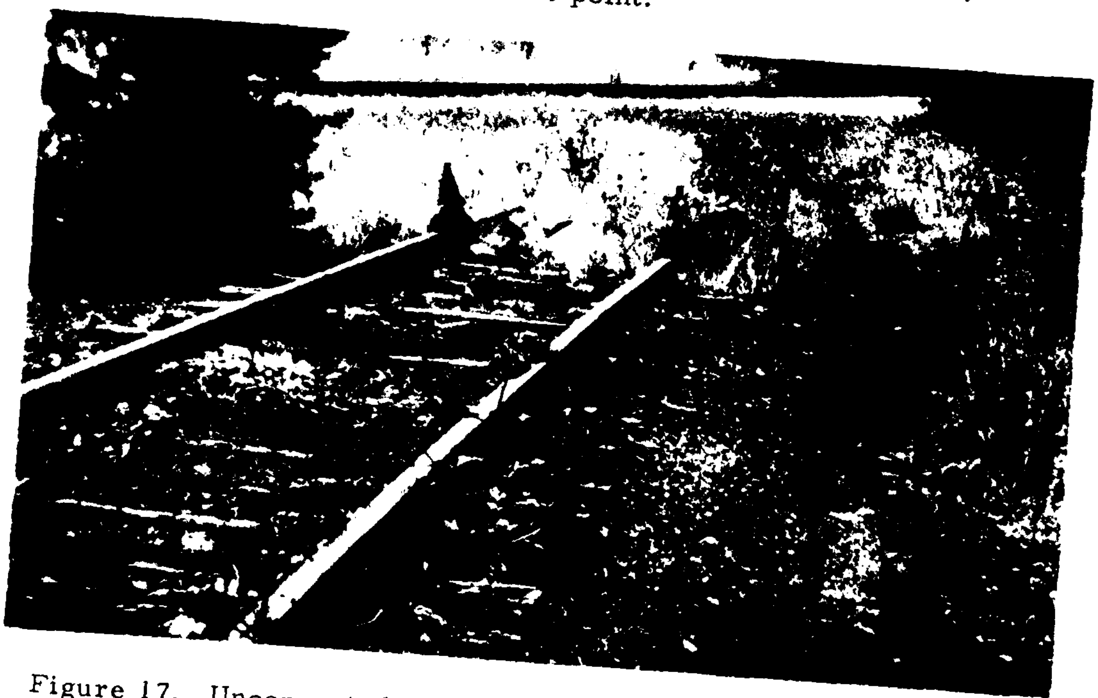


Figure 17. Unconnected CONRAIL wye (north portion). CONRAIL main line is in background.

Track 17 (E3) is a 10-railcar-capacity ladder track used both for transit and for temporary storage (fig 18). E3 runs into Fort Drum ladder track 18 from which emanate tracks L6, L7, L8, L9, L10, and L11.

Figure 18. Tracks 19, 20, 21, 22, 23, 24, and 17, and ladder track 18 (left to right).

Track 24 (E4) is a 16-railcar-capacity classification yard track (fig 18). E4 can be used for empty or for loaded car storage.

Tracks 22 and 23 (S1 and S2) are classification yard tracks of 22- and 18-railcar capacity, respectively (fig 18). They may be used for either empty or loaded car storage.

The track connecting the CONRAIL main line to the Fort Drum wye (S3) is 3-1/2 miles long and is the rail entry into Fort Drum (see fig 16). This section of track is used for transit and for unloaded or loaded storage at different times.

Ammunition storage track. Fort Drum's ammunition storage area is in the southern portion of the post and contains a single railroad track (fig 19) that connects to a CONRAIL main line (fig 20) running southwest to north through Fort Drum. The fenced-in ammunition storage area contains a single 475-foot track with a concrete side-loading ramp (fig 21). In outloading operations, this area will be used only to load ammunition.

Figure 19. Railroad track in Fort Drum ammunition storage area.

Figure 20. CONRAIL main line on the right. Spur track leads to Fort Drum ammunition storage area and town of Deferiet.

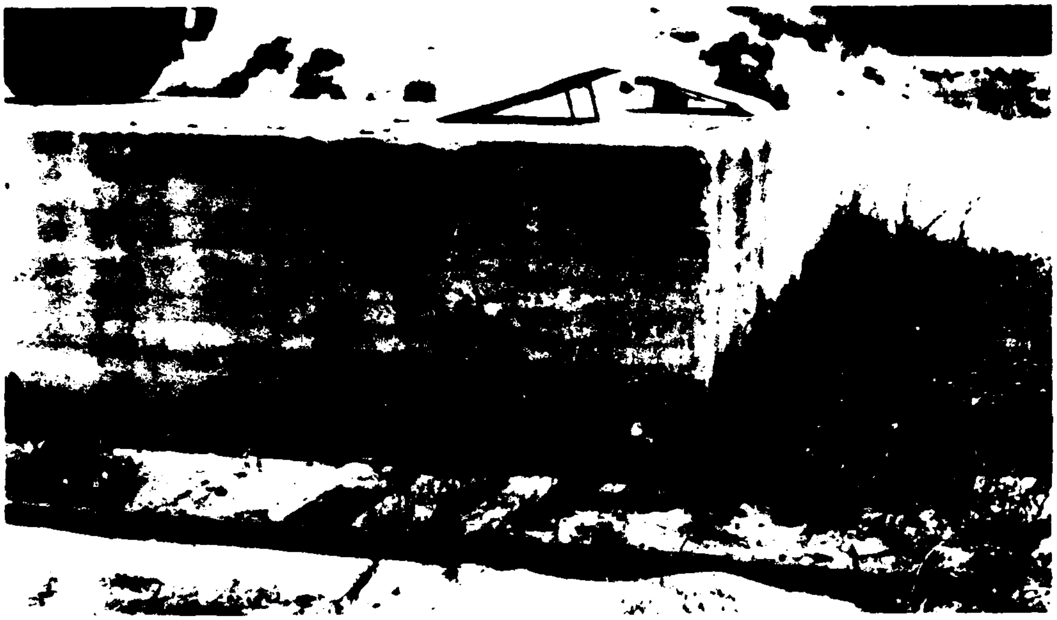


Figure 21. Concrete side-loading ramp, ammunition storage area.

Most of Fort Drum's rail trackage is in good condition and meets Federal Railroad Administration Class 2 standards; however, there are certain exceptions, identified in figures 22, 23, 24, and 25. These repairs must be completed to support large-scale outloading operations. Fort Drum has a scheduled program of track maintenance that should upgrade the installation's trackage condition and maintain it as a Class 2 standard.

Access to Fort Drum's rail system is good. Vehicles from motor pools and equipment from storage areas can be routed along good, asphalt roads to any of the loading sites. This fact, coupled with the potential of the rail system, indicates that Fort Drum can develop sufficient capability to successfully outload an armored division within a 10-day time frame. Outloading additional units during the same time frame would require support and use of CONRAIL facilities in Watertown, New York.

C. CURRENT PROCEDURES

The Consolidated Rail Corporation serves Fort Drum with a main line through the installation and by a wye track leading onto post. Fort Drum does not have any Government-owned locomotives. CONRAIL

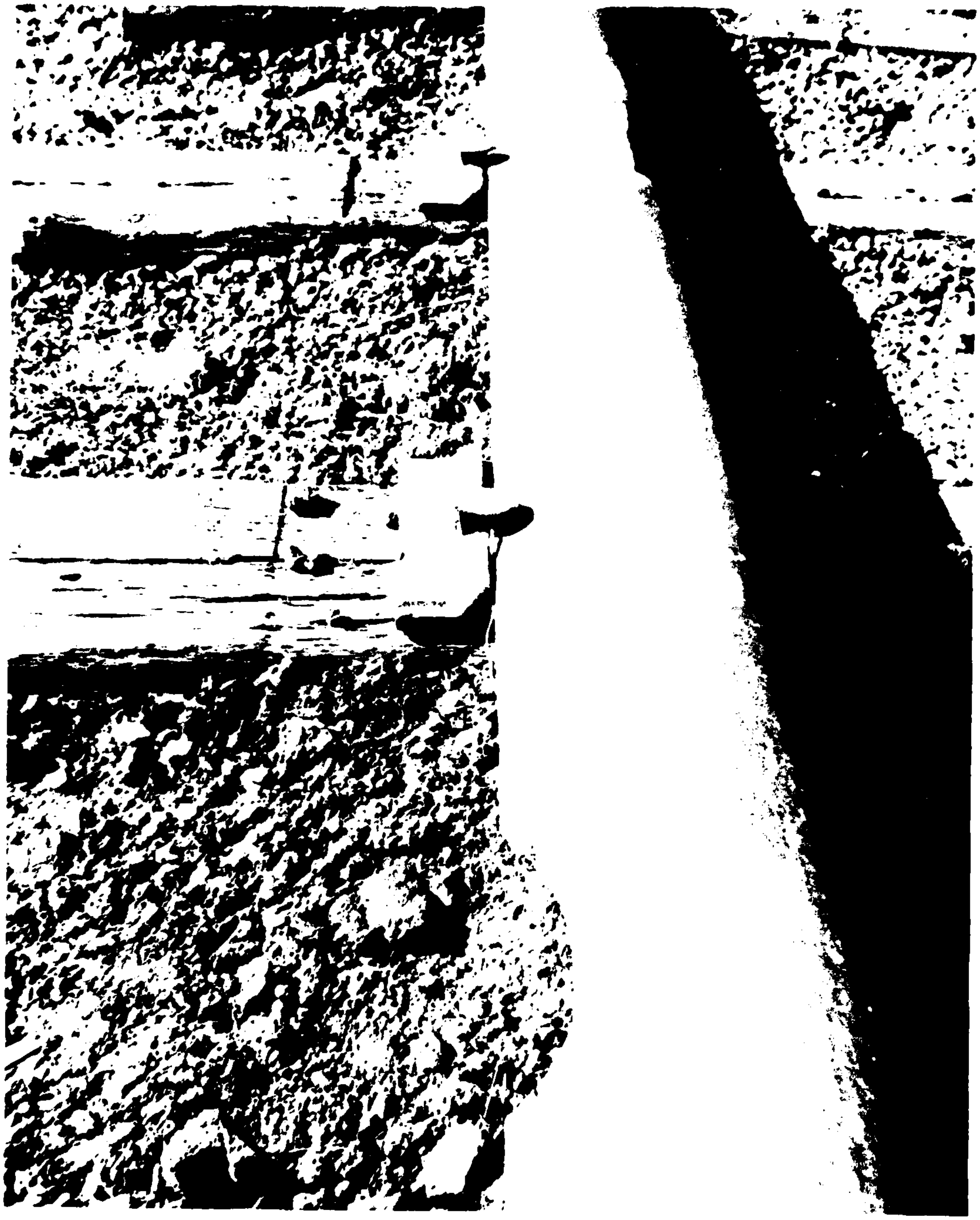


Figure 22. Broken rail near end of track 32.

Figure 23. Deteriorated ties marked for replacement, south end of track 32.

Figure 24. South end of track 2, uncontrolled weed and tree growth.

Figure 25. Additional ballast and tie replacement needed, track 19.

provides railcar interchange and switching services. Although most incoming supplies are delivered by truck, some ammunition and supplies are delivered by rail. Currently, no rail outloading plans have been developed by Fort Drum personnel.

D. RAIL SYSTEM ANALYSIS

1. Current Outloading Capability

An FRA inspector conducted a survey of all Fort Drum trackage and found that most of the track meets FRA safety standards for Class 2. However, certain sections of the trackage are less than Class 2 and require repair to support maximum outloading operations. The report is contained in appendix D.

Current rail outloading capability at Fort Drum is limited due to the physical attributes of the rail system and to the shortage of small handtools, bridgeplates, and blocking and bracing materials. Utilizing current facilities, Fort Drum's mobilization outloading capability is approximately 138 railcars per day. This outloading rate does not meet the requirement to outload the proposed mobilized armored division and its support units within a peak 10-day loading period. Use of end ramps and track modifications, as identified in Plan 6, as well as use of the CONRAIL Watertown facilities will increase the outloading capability to meet the mobilization outloading requirement.

Fort Drum does not stock blocking and bracing material. These materials are ordered when the requirement arises. Also needed for a maximum efficient outloading operation are adequately trained blocking and bracing crews and completed outloading plans.

2. Rail Outloading Analysis

A complex system structure can be viewed as a series of interconnected subsystems. The limiting subsystem within the system establishes the maximum outloading capability. Therefore, in ascertaining the maximum rail outloading capability of Fort Drum, the following subsystem separation was used:

a. Commercial Service Capabilities

Commercial service capabilities present no problem to Fort Drum. The common carrier serving the post is CONRAIL, and their operations in the vicinity of Fort Drum appear well

organized. Also, since Watertown, New York, is a major rail center and only about 12 miles from Fort Drum, rail support for the outloading operation should not be a major problem.

b. Moving to and Loading on Railcars at a Particular Site

The movement of cargo to loading sites is relatively quick and efficient since most of the equipment is self-propelled and access is along good, paved roads. Traffic patterns and traffic control would have to be set up, but such measures should be standard for full-scale outloading operations. Staging areas near the outloading sites are adequate, but queuing will block some streets. Recent field tests, during loading operations, revealed that vehicles move along the flatcars at an average speed of 1 mile per hour, with only one vehicle moving on a railcar at any one time. The longest string of empty flatcars used by the recommended outloading plan, assuming 57-foot car lengths (coupler-to-coupler), was 36 cars. Using that figure, the first vehicle would reach the end of the last car 23 minutes after driving up the ramp; then blocking and bracing could begin. Loading time is insignificant in comparison with blocking and bracing time (table 3). Therefore, moving to and loading on the railcars is not the limiting subsystem. However, driving wheeled vehicles on flatcars "circus style" depends on the use of bridgeplates to span the gap between the cars.[3/] According to the plan employed in our analysis, bridgeplates are required for simultaneous loading at all sites where wheeled vehicles are to be loaded.

c. Blocking, Bracing, and Safety Inspections

Blocking, bracing, and safety inspection times are difficult to project. They depend on a number of variables such as:

(1) Crew size and experience.

(2) Extent of the safety inspection.

(3) Documentation.

[3/] Circus style load--equipment is end loaded under its own power with little or no effort to fully utilize all floor space on the railcar; time is critical.

TABLE 3

TIMES REQUIRED TO PERFORM VARIOUS LOADING FUNCTIONS

	Action	Type Vehicle or Item Being Loaded	How Loaded	Time Required Min-Sec	Considerations
Bilevels	Vehicles Driving on Bilevel Railcars (89-ft long)	Jeep	Own power	1'-00" per Railcar Length	Average of 5 timings
Bilevels	Vehicles Driving on Bilevel Railcars (89-ft long)	1-1/4-Ton Pickup	Own power	1'-03" per Railcar Length	Average of 6 timings
Bilevels	Vehicles Driving on Bilevel Railcars (89-ft long)	Gama Goat	Own power	1'-32" per Railcar Length	Average of 8 timings
Bilevels	Average Total Time to Load, Tiedown Vehicles on Bilevel Railcar, Complete	The three types above plus 3/4-ton trucks, mixed	Own power	34'-00" per Railcar	Average number of Bilevels loaded in string of cars - 15
TOFC's	Truck Tractor Backing Semitrailers on String of 89-ft TOFC Railcars	Semitrailers	Truck tractor	0'-42" per Railcar Length	Average number of TOFC cars in string --11, 2 trailers per car
TOFC's	Average Total Time to Load and Secure Semi-trailer to Hitch on TOFC Railcar	Semitrailers	Truck tractor	10'-00" per Semi-trailer	Average number of TOFC cars in string --11, 2 trailers per car
Flats	2-1/2-Ton Trucks Circus Loading on 60-ft flats	2-1/2-Ton Trucks	Own power	30"-45" per Railcar Length	Average of several timings
Flats	Total Time to Circus Load 11 60-ft Flats With 2-1/2-Ton Trucks, 2 per car (load only)	2-1/2-Ton Trucks	Own power	35'-00" per 11 60-ft Cars	
Forklift	Average Time for Rough Terrain Forklift Truck to Pick Standard-Size Containers (6-ft Wide, 8-ft Long, 5-ft High Approx) off Flatbed Truck, Transit 75 ft, and Load on Rail Flatcar.	Containers	Forklift	2'-12" per Container	Average of loading of 18 containers

(4) Availability of blocking and bracing material and materials-handling equipment (MHE).

During REFORGER 76, the establishment, as a reasonable goal for crews, of a 5-1/2- to 7-hour time limit for loading, blocking, and bracing at a loading site was based on experience and actual field tests of circus-style loadings. In addition, discussions with the blocking and bracing instructors at the US Army Transportation School, Fort Eustis, Virginia, indicated that, to avoid wasted manhours, there should be no more than eight men per crew, regardless of experience.

At Fort Drum, blocking and bracing materials and small handtools are in short supply. These items, which are available locally, should be stockpiled to assure that the division and its support equipment can be outloaded within the time specified by the contingency plan. Blocking and bracing crews should be trained on a periodic basis.

d. <u>Interchange of Empty and Loaded Railcars</u>

An efficient interchange of empty and loaded railcars requires careful planning and good coordination with the common carrier. Such an interchange can be established at Fort Drum because CONRAIL has good rail access and adequate trackage exists for interchange and storage of railcars.

The existence of the large CONRAIL railyards in Watertown makes it possible to accumulate the empty cars required to maintain the operation. The various plans for spotting railcars depend on the type of operation. A place or location must be provided for railcars (1) in empty storage, (2) in loaded storage, and (3) at the loading sites. In general, three balanced or equally divided areas must exist somewhere in the vicinity.

Empty railcars destined for Fort Drum should be accumulated and classified in Watertown prior to being moved to Fort Drum. Thus, if the interchange of railcars follows some semblance of the organization presented in the simulation (app B), this subsystem will not limit the rail outloading capabilities of Fort Drum.

e. <u>Summary</u>

Considering all the subsystems, the shortage of blocking and bracing materials, bridgeplates, and small handtools, along with the lack of trained blocking and bracing crews, emerges

as the primary factor restraining any large rail outloading operation at Fort Drum and the Watertown area. Therefore, provision of these items is the major prerequisite for a successful operation.

Another factor that affects station outloading at Fort Drum is the destination of the unit material after it leaves the installation. Since Fort Drum's POE may be either an east, west, or gulf coast facility, the worst case, or longest distance to POE, requires that all the division equipment go by rail.

This means that, for any major operation, a maximum effort with consequent high outloading rates will be required. Although Fort Drum's rail system and the common carrier facilities serving it have the potential for supporting the deployment of the division and other support units in a timely manner, the actual capability at any one time will depend on the capability of the supporting subsystem.

3. Rail System Outloading Options

The various options for outloading plans are shown in table 4. Seven plans for daylight-only loading were developed, using various combinations of recommended rail loading sites at both Fort Drum and the CONRAIL facilities at Watertown.

As soon as the loading, blocking and bracing, and inspection of the cars are completed, the outloading operations may begin. Through proper planning, 120-ton locomotives can bring empties for the next cycle and pick up loaded cars from the loaded tracks. The exact procedure for all switching operations, arrival of locomotives and empties, and departures is described in detail in the simulation for Plan 6 in appendix B. Six plans were developed to provide the approximate daily outloading rates of 50, 100, 150, 200, 250, and 350 railcars for all the equipment and one additional plan of 205 railcars for the nonroadable equipment only. All plans function similarly.

Plan 1 uses tracks L1 and L2 located off the northeast leg of the Fort Drum wye, to produce an output of 56 railcars per day. Plan 2 adds tracks L3 and L4, which fully utilize the entire loading area near the northwest leg of the installation's wye track, for a total of 108 railcars per day.

TABLE 4

FORT DRUM RAIL SYSTEM OUTLOADING OPTIONS

Track Section and Facilities	Railcar Capacity 57-ft (Coupler to Coupler)	Type End Ramp	Repair/ Construction Costs a/ b/	Plan 1 56 RCPD	Plan 2 108 RCPD	Plan 3 144 RCPD	Plan 4 192 RCPD	Plan 5 269 RCPD	Plan 6 344 RCPD	Plan 7 (205 RCPD) (Nonroadable Equipment)
L1	29	Concrete/gravel		X	X	X	X	X	X	X
L2	27	Concrete/gravel		X	X	X	X	X	X	X
L3	26	Concrete/gravel			X	X	X	X	X	X
L4	26	Concrete/gravel			X	X	X	X	X	X
L5	36	None	Ramp			X	X	X	X	X
L6	18	None	Ramp				X	X	X	X
L7	15	None	Ramp				X	X	X	X
L8	18 (4 positions used)	None					X	X	X	
L9	18 (4 positions used)	None					X	X	X	
L10	17 (4 positions used)	None					X	X	X	
L11	17 (3 positions used)	None					X	X	X	
L12	28	None	Ramp					X	X	X
L13	26	None	Ramp					X	X	
L14	23	None	Ramp					X	X	
Watertown, NY Massey Yard Tracks 9, 10, 11, and 19	75	None	Four ramps						X	
Total costs based upon timber end ramps b/		Timber:				$ 2,500	$ 7,500	$15,000	$ 25,000	$10,000
		Concrete:				10,000	30,000	60,000	60,000 10,000 c/	40,000

LEGEND

X - Track used for that option

RCPD - Railcars per 24-hour day

a/ No specific costs are identified for track maintenance at Fort Drum since funds are programed each year

b/ Average cost for a timber end ramp is $2,500 and for a concrete end ramp is $10,000.

c/ Portable timber ramps at Massey yard

Plan 3, which produces an outloading rate of 144 railcars per day, requires the addition of track L5, a track that requires some modification.

Plan 4 adds tracks L6, L7, L8, L9, L10, and L11 to achieve 192 railcars per day.

Plan 5 adds tracks L12, L13, and L14 for a total output of 269 railcars per day.

Plan 6, the recommended plan, adds in the commercial facilities at Watertown, and is shown in detail in appendix B. This plan achieves an outloading capability of 344 railcars per day, which fulfills the requirement to outload the armored division and the other mobilized units within approximately 10 days.

Plan 7 uses tracks L1, L2, L3, L4, L5, L6, L7, and L12 for the movement of all nonroadable equipment during peak outloading.

4. <u>Physical Improvements and Additions</u>

Items listed below are all minimum requirements to provide the recommended outloading/receiving rate of 344 railcars per day (Plan 6), using existing trackage.

a. Repair track deficiencies indicated in the FRA track inspection report (app D), and construct timber or concrete end-loading ramps at L5, L6, L7, L12, L13, and L14.

b. Repair concrete end-loading ramps at L1, L2, L3, and L4.

c. Acquire a minimum stock of blocking and bracing material needed to supplement the post organic supply for handling all equipment when a rapid deployment of post units is required.

d. Acquire bridgeplates for volume outloading of wheeled vehicles.

e. Acquire sufficient small tools to permit operation of blocking and bracing crews at all outloading sites. This includes powersaws, cable cutters, wrecking bars, cable-tensioning devices, hammers, and so forth.

5. Analysis of Railcar Requirements

The expected rail outloading from Fort Drum will be an armored division and other support-type units. At Fort Drum's peak outloading period (outloading of the division and selected support units at the same time), these units will require 3,427 railcars, as indicated in table 5. The division and support units can be outloaded in 10 days using the Fort Drum and the CONRAIL Watertown facilities. Other smaller units outloading prior to or after the peak outloading period impose no constraint on the system. The proposed rail outloading procedure (app B) can also be used for these units.

TABLE 5
ARMORED DIVISION AND SUPPORT UNITS RAILCAR REQUIREMENTS

	Number of Railcars			
Type of Equipment	57-Foot	80-Ton	Box	Total
Roadable	1,367	0	0	1,367
Nonroadable	1,913	8	0	1,921
Tracked	(1,049)	(8)	0	(1,057)
Other	(864)	0	0	(864)
Miscellaneous	0	0	139	139
Total	3,280	8	139	3,427

Planners may outload the division units at Fort Drum and the support units at Watertown, or intermingle the units between the two outloading sites.

6. Discussion of Time and Costs

a. Physical Improvements

Costs for track repair are not identified specifically but are included in the yearly rail maintenance program. FY 79 will see $105,000 spent on track maintenance to upgrade substandard sections of track to Class 2 standards. Timber ramps for end loading will cost approximately $2,500 each, and concrete end ramps will cost approximately $10,000 each.

b. Load Time Versus Equipment Type

(1) Mobilization Moves

Two basic types of outloading moves are mobilization and administrative. Since mobilization moves occur only during national emergencies, urgency is paramount. The most rapid method of loading and securing mobile equipment on railcars is circus-style. For example, if unit integrity is to be maintained, the 2-1/2-ton trucks that are to pull trailers drive onto the string of railcars, towing their trailers, and the equipment is secured in this configuration. This procedure is fast, but it wastes railcar space. During actual field tests on standard-type railcars, the loading, securing, and inspection of 2-1/2-ton trucks (two per railcar), site times varied from 5 hours for flatcars with chain tiedowns to 6-1/2 hours for flatcars without chain tiedowns (fig 26 and table 6, items 4 and 5). This was a fast, efficient operation. Other similar operations that could occur for most Army units in a mobilization-type move, include loading various sizes of containers onto standard-type flatcars using forklifts. This operation, including loading, securing, and so forth, was accomplished in 5-1/2 hours (table 6, item 9).

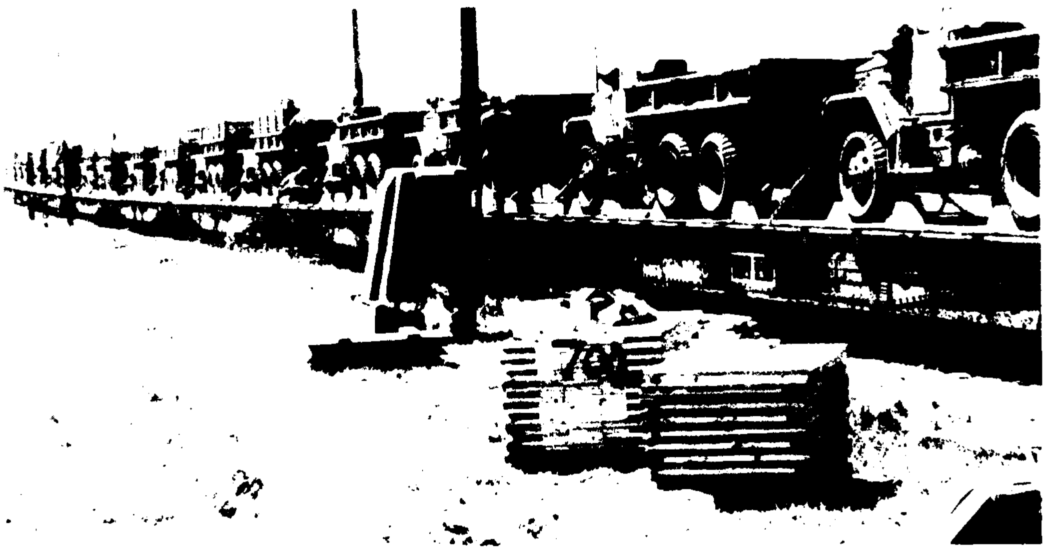


Figure 26. Circus-style loading of 2-1/2-ton trucks.

TABL

TYPICAL SITE LOADING AND BLOC

LEGEND
Type Railcar
Bl - Bilevel
TOFC - Trailer on flatcar
COFC - Container on Flatcar
DF - Flatcar/Inte
F - Standard-Type

Item	Type Railcar	Average Number Loaded (Range)	Type Load	How Loaded	Total Site Time Required (hrs) and Other Considerations	Detai
1	Bl 89 ft	16 15-17	C	End, own power	7.5 All cars had chain tiedowns. Cars did not have bridge PL's, wooden PL's used	Typical Load: 50 6-1¼ ton, 14 Gama number vehicles -
2	Bl 89 ft	14½ 11-18	C	End, own power	10.7 All cars did not have chain tiedowns, used wooden bridge PL's.	Typical Load: 50 6-1¼ ton, 14 Gama number vehicles -
3	TOFC 89 ft	12 10-12	C	End, backed on by tractor	4.0	Semitrailers - most to form 40-ft semis military vans on se
4	DF 60 ft	11 9-14	C	End, own power	5.1 Chain tiedowns on all cars, wood wheel chocks, lateral wood blocking at wheels	All 2-1/2-ton truck per railcar.
5	F 54 ft	10	C	End, own power	6.5 Cable tiedowns made at site. Wheel chocks, lateral wheel blocking	All 2-1/2-ton truck per railcar.
6	F 54 ft	10 9-10	A	End, own power. Some forklift	10.0 Cable tiedowns made at site. Wood blocking as required.	1/4-ton trailers Wreckers Forklifts Mules, jeeps, CONEX
7	F 54 ft	9	A	Forklift, manpower	10.8 Cable tiedowns made at site. Wood blocking as required.	All 1/4-ton trailers of similar small ite
8	DF 60 ft	10 8-13	A	Rough terrain forklifts	8.3 Chain tiedowns on all cars. Wheel blocking used also	All two-wheeled trai pulled by 2-1/2-ton 5 trailers/railcar
9	F 54 ft	9	A	Rough terrain forklifts	5.5 Cable tiedowns made at site. Blocking as required.	All containers - 5 cars with 8 contai 3 cars with 4 contai 1 car with 10 contai

TABLE 6
LOCKING AND BRACING TIMES (TOTAL)

Type Load
A - Administrative
C - Circus

Integral Chain Tiedowns
-Type Flatcar

Details on Type Load	Manpower	Typical Problems
50 jeeps, 15-3/4-ton trucks, Gama Goats, each level, total es - 170	1½-2 men per vehicle	No bridge PL's on cars had to use wooden PL's. Man has to walk to front of vehicle as guide and to straighten bridge PL's. Delays if all vehicles not at site at loading time.
50 jeeps, 15-3/4-ton trucks, Gama Goats, each level, total es - 170	1½-2 men per vehicle	Same as above; and, missing tiedowns; cable tiedowns had to be fabricated and used. (Storm, rain not included in total time)
- mostly MILVAN married together semis. Some 20-ft semis and on semis. Two per TOFC car.	6-8 man crew	Some older cars have trailer hitches which have to be "pulled-up" into position by a cable attached to the tractor.
trucks, various kinds, two	10 men per railcar	None
trucks, various kinds, two	10 men per railcar	None
rs CONEX containers	10 men per railcar	Improper installation of tiedowns and blocking. Large number of small items, 1/4-ton trailer slow the installation of blocking since work has to proceed from one end of railcar to the other.
ailers or high percentage ll items.	10 men per railcar	Improper installation of tiedowns and blocking. Large number of small items, 1/4-ton trailer slow the installation of blocking since work has to proceed from one end of railcar to the other.
d trailers (various types 2-ton trucks) lcar	10 men per railcar	None noted
- containers each. containers each containers each.	10 men per railcar	None noted

2

All things considered, the circus-style loading operations indicate that, for mobilization moves, using standard-type flatcars, the loading, blocking and bracing, and inspections can be accomplished within from 5-1/2 to 7 hours for most equipment types (table 6, items 9 and 5). However, if a unit has a significant number of small items, such as "mules" (table 6, item 6), they are likely to require a 10-hour site time; this should be considered, rather than assuming that the work can be accomplished within 7 hours.

(2) Administrative Moves

For an administrative move, plenty of planning time exists; night operations are unnecessary except to finish work that is not completed during daylight hours and to switch railcars. This added flexibility helps to solve unforeseeable problems. The administrative move allows time for accumulating special-type railcars, such as bilevel autoracks and TOFC and COFC cars, which significantly reduce both labor and costs. For instance, small vehicles, jeeps, 3/4-ton trucks, 1-1/4-ton trucks, and gama goats can be loaded on bilevel cars (fig 27); semitrailers and vans can be loaded on TOFC cars; and MILVANs, for which there are no chassis, can be loaded

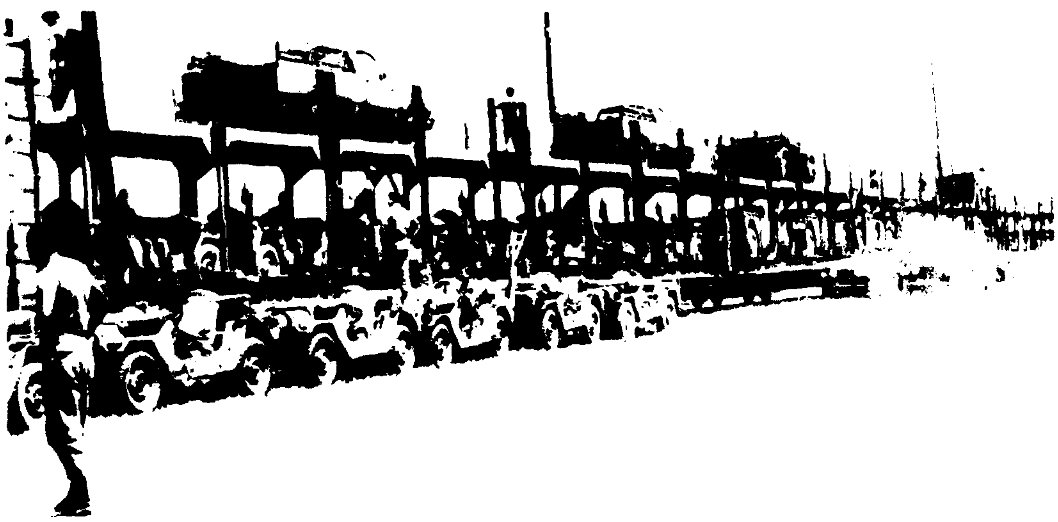


Figure 27. Lower level of bilevel cars loaded with jeeps, gama goats, 3/4-ton trucks, and 1-1/4-ton trucks.

on COFC cars. Mobile equipment, some 2-1/2-ton trucks, and all smaller vehicles can be loaded on bilevel railcars. These three specific types of railcars require no blocking and bracing except that integral to the car.

Loading and securing times for bilevels varied from an average of 7-1/2 hours for a string of cars that were fully equipped with chain tiedowns to 10-3/4 hours for those where cable tiedowns had to be fabricated to replace missing chain tiedowns. The average total time for TOFC cars was 4 hours. Administrative loads, which require relatively longer times and more effort are illustrated in figures 28 and 29[4/]. This type of load required a total site time of 10 to 11 hours. In general, administrative moves should be planned for daylight hours, leaving night hours available for finishing up sites that started late or were slowed by problems and railcar switching. This type of planning allows enough flexibility to resolve problems and complete the operation on schedule. For mobilization moves, site time to load and secure equipment on a string of railcars should be accomplished in 5-1/2 to 7 hours, and for administrative moves, in 4 to 11 hours (table 6, items 3 and 7).

The time/motion studies conducted during the REFORGER 76 exercise (an administrative move) resulted in the accumulation of valuable information for planning future station outloading operations and is included in tables 3 and 6. It should be noted that times required to load are relatively minor as compared with times required to secure the equipment. As an example, a jeep can drive across an 89-foot-long bilevel car in 1 minute, and a forklift truck can load a container in 2 minutes 12 seconds. So, loading times are not the problem. Also, as soon as the first vehicle is in position, several simultaneous operations are in effect--loading, blocking, and tieing down. Thus for future planning, site times

---

[4/] Administrative load--equipment to be loaded (wheeled or otherwise) is placed on the car so as to achieve maximum utilization of floor space; may be stacked; cost is important. Both types of loads, circus and administrative, may be used in either a mobilization or administrative move depending upon the type of equipment to be moved. An example is--item 9 in a mobilization move, item 5 in an administrative move.

Figure 28. Administrative loading, mules.

Figure 29. Administrative loading, 1/4-ton trailers.

should be used; as a general rule, 5-1/2 to 7 hours for a mobilization move, and 4 to 11 hours for an administrative move. The 5-1/2-hour minimum for a mobilization move is based on the assumption that only standard-type railcars are available. The 4-hour minimum for an administrative move carries the assumption that there is time to plan and assemble the most appropriate type of railcars for the equipment to be moved.

The 4 hours, in this instance, was the average time required to load and secure semitrailers and vans on a string of twelve 89-foot-long TOFC cars.

To minimize the number of faulty or unacceptable loads that have to be done over, inspection of the loaded cars by the railroad inspector should proceed simultaneously with the work.

c. <u>Transportation Equipment Costs--Bilevel Railcars Versus 54-Foot Standard Flatcars</u>

A cost comparison, using nine difference types of equipment scheduled for outloading in the REFORGER 77 exercise, revealed that $129,431 in transportation and materials (timber, cable, and so forth) could be saved by shipping the equipment on bilevel railcars rather than on standard-type 54-foot flatcars. The equipment items vary from 1/4-ton trailers to 2-1/2-ton trucks. A total of 623 vehicles could be transported on 55 bilevel railcars; see table 7 for details and appendix C for more information on special-purpose railcars.

TAB

COST COMPARISON, BILEVELS

Column Number	1	2	3	4	5	6
Item No.	Vehicle Type	Model Number	Weight (lbs)	Height (in.)	Length (in.)	Quantity to be Shipped
1	2-1/2-Ton Truck	M35A2	13,360	80.8	264.8	110 1/
2	Gama Goat, 1-1/4-Ton	M561	7,480	71.9	231.1	27 1/
3	M105A2 1-1/2-Ton Trailer	M105A2	2,670	82.0	166.0	113
4	1/4-Ton Trailer	M416	580	44.0	108.5	136
5	400-Gal Water Trailer	M149A1	2,530	80.6	161.4	20
6	1-1/4-Ton Truck	M880	4,695	73.5	218.5	11
7	3/4-Ton Trailer	M101	1,350	50.0	147.0	8
8	1/4-Ton Truck	M151	2,350	52.5	131.5	180
9	1-1/4-Ton Como Truck	M884	4,648	67.5	218.5	18
	Total					623

SUMMARY

Total cost to ship the 9 different items (623 vehicles) by 54-foot-long standard flatcars,

Total cost to ship the 9 different items (623 vehicles) by 89-foot-long bilevel flatcars, C

Savings in transportation costs if shipped by bilevel flats (Column 10-- Column 14)

Additional costs of blocking and bracing materials if shipped by 54-foot standard flatcars

Total savings if these nine items shipped by bilevel versus 54-foot flatcar

1/ Excess vehicles shipped on other railcars that are not completely utilized.

2/ Estimated average additional costs of blocking and bracing materials per vehicle.

TABLE 7

LEVELS VERSUS 54-FOOT FLATCARS

ty e ed	7 Quantity on 54-ft Railcar	8 Dollars	9 No. of 54-ft Cars Required	10 (8 x 9) Trans Cost for Item	11 Quantity on 89-ft Bilevel	12 Dollars	13 No. of Bilevels Required	14 (12 x 13) Trans Cost for Item
1/	2	2,413	55	132,715	6	7,238	18	130,284
	2	2,167	13	28,171	8	5,402	4	21,608
	3	2,167	37	80,179	12	3,612	9	32,508
	10	2,167	14	30,338	36	3,612	4	25,284
	4	2,167	5	10,835	12	3,612	2	7,224
	2	2,167	5	10,835	8	3,612	2	7,224
	4	2,167	2	4,334	12	3,612	1	3,612
	7	2,167	25	54,175	14	3,612	13	46,956
	2	2,167	9	19,503	8	3,612	2	4,334
				371,085			55	279,034

tcars, Column 10	$371,085	
ars, Column 14	279,034	
	$ 92,051	
tcars	37,380	($60[2/] x 623)
	$129,431	

2

III. ANALYSIS OF COMMERCIAL RAIL FACILITIES WITHIN THE FORT DRUM AREA

The present rail facilities at Fort Drum are not adequate to handle the entire mobilization requirement of the installation. Therefore, the commercial CONRAIL facilities at Watertown will be needed to meet the full-scale rail outloading requirement. All commercial rail facilities within 25 miles of Fort Drum were surveyed to determine the feasibility of their use during full-scale rail outloading operations (table 8 and figs 30 through 33). Many factors were considered in making the determination, including:

TABLE 8
RAILROAD FACILITIES WITHIN THE FORT DRUM AREA

Location and Figure Number	Ramp Facilities	Lighting	Surface Conditions	Staging Area	Railcar Capacity	Access Availability	*Present Track Conditions
CONRAIL Massey Yard, Watertown, NY (Figs 30 and 31)	Side loading ramps	No	Good	Yes	850	Good, 12 miles from Fort Drum	Class 2
Carthage, NY yard (Fig 32)	None	No	Good	Limited	192	Limited, 5 miles from Fort Drum	Class 2
Gouverneur, NY yard (Fig 33)	None	No	Good	Limited	193	Good, 13 miles from Fort Drum	Class 2
Blue Seal Feed Plant spur, Watertown, NY	None	No	Fair	Limited	5	Limited, 12 miles from Fort Drum	Class 2
Lumber yard spur, Dorsey St, Watertown, NY	None	No	Fair	Limited	15	Limited, 12 miles from Fort Durm	Class 2
St. Regis Paper Co Industrial yard, Deferiet, NY	None	No	Fair	Yes	105	Good, 3 miles from Fort Drum	Class 2
Siding, Philadelphia, NY	None	No	Good	No	120	Limited, 5 miles from Fort Drum	Class 2

*Indicates track condition based on a general inspection, not a detailed inspection of all track components, which might result in a lower classification of the track.

a. Road access to the facility.

b. Type of facility available--ramps, lighting.

c. Equipment staging and queuing areas.

d. Railcar storage and loading capacities.

e. Track and facility maintenance conditions.

f. Main line activity levels.

g. Added expense of using commercial facilities.

h. Security problems.

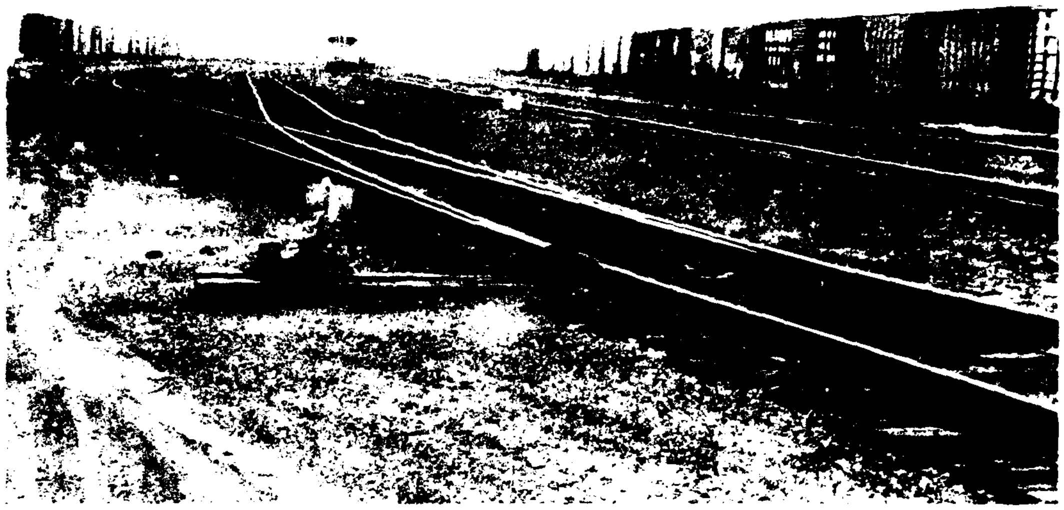


Figure 30. CONRAIL Massey Yard, Watertown, New York.

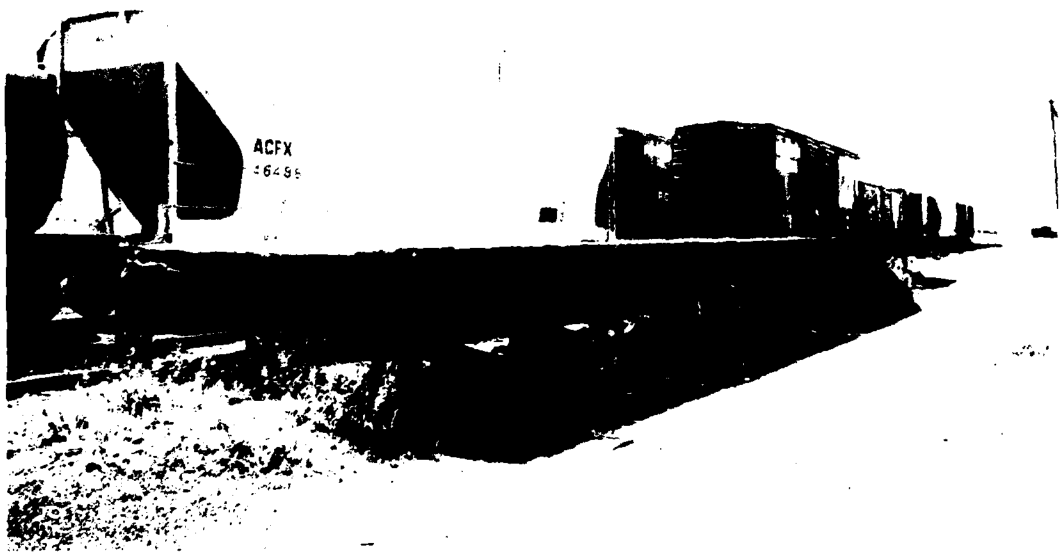


Figure 31. Side-loading ramp, Massey Yard, Watertown, New York.

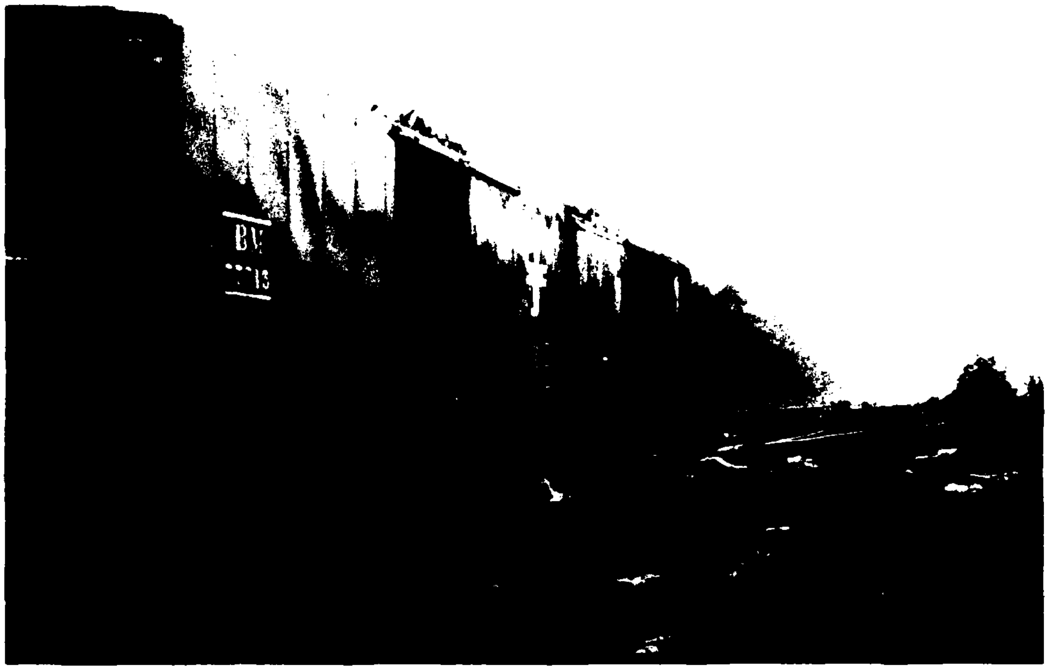


Figure 32. Rail facilities, Carthage, New York.

Figure 33. Rail facilities, Gouverneur, New York.

The commercial rail facilities are capable of supporting large-scale rail outloading operations at Fort Drum. The CONRAIL Massey yard has classification yard tracks that can be used to provide the additional outloading capability required for mobilization. Massey yard tracks 9, 10, 11, and 19 may be used for vehicle outloading, utilizing portable end ramps. These tracks have sufficient capacity to load 75 railcars a day to fulfill the Fort Drum outloading requirement without interfering with yard switching and classification operations. Possible complications involving security and splitting of operations are considerations if off-post facilities are used for outloading.

IV. SPECIAL EQUIPMENT FOR EXPEDITING THE OUTLOADING OF MILVANS

A large supply of trailer-on-flatcar railcars is usually in the system, and container-on-flatcar railcars may be available. These cars should be used to transport semitrailers and MILVANs. If COFC or TOFC flatcars are not available, some blocking and bracing time and expense can be saved by using bulkhead flatcars for transporting MILVANs. See appendix C for additional information.

V. ANALYSIS OF MOTOR SYSTEM OUTLOADING CAPABILITY

A. GENERAL

Major highway access to Fort Drum is provided by US Route 11, which parallels the northwest boundary of the installation, and by New York Routes 3 and 3A, which follow the southern boundary of the post. All highways connect to Interstate Route 81, which is approximately 12 miles west of Fort Drum. The internal road network within Fort Drum is capable of handling all types of highway vehicles along its major arteries. Neither access to the highway system nor the system itself restrains motor outloading capability or movement of roadable military vehicles.

B. MOTOR LOADING FACILITIES

Basically two types of motor vehicles, that is flatbed and van semitrailer, would be required to meet the motor outloading needs of Fort Drum. A description of the loading facilities associated with each vehicle type follows:

1. Loading Ramps

A survey of facilities that might have end-loading ramps to load vehicles onto commercial flatbed semitrailers revealed that there are 9 such ramps with 10 outloading positions that could be used concurrently with a rail outloading operation (table 9 and figs 34 through 41). As a separate operation without rail outloading, there are 20 ramps with 21 outloading positions, including all existing rail ramps and those recommended for construction.

2. Loading Platforms/Docks

The other type of motor outloading facility is the loading platform from which va ı semitrailers are loaded. It is the medium, along with the forklift, that is used to transfer cargo from truck to truck, truck to warehouse, and vice versa. The warehouses located along Utility Road, Ordnance Street, Oswego Avenue, and Warehouse Road are best suited for van semitrailer loading, since they have numerous loading docks. Using selected warehouses on these streets and roads, over 39 van outloading positions could be utilized. Figure 42 illustrates a typical van outloading at Building T-97 along Oswego Avenue.

TABLE 9

VEHICLE END-LOADING RAMPS AND DOCKS

Ramp or Other Device (Figure Number)	Location	Type of Ramp or Dock	Surface Conditions	Staging	Access	Remarks
Concurrent with Rail Operations						
1 (Figs 34 and 35)	Between Oneida and Ontario Aves bordering on 1st St East	Concrete	Good	Yes	Good	2 positions available, some repair needed
1 (Fig 36)	New Jersey NG MATES area	Timber and earth with gravel surface	Good	Yes	Good	
1 (Fig 37)	Maintenance area 3rd St East/St. Lawrence	Timber	Good	Yes	Good	
1 (Fig 38)	Near Building T 97	Timber	Good	Limited	Good	
5 (Fig 39)	Various equipment motor pools	Grease racks	Good	Good	Good	For vehicle loading safety stops need to be removed or wooden planks placed to equal the height of the stop. Use for light vehicles.
2 (Fig 40)	Unit motor pools	Semitrailer, low-bed, 40-ton, M870	Depends on site selected	Depends on site selected	Depends on site selected	May be used as a portable end loading ramp. These ramps are not included in the estimate of outloading capability as they are unit equipment.

TABLE 9 - cont

Ramp or Other Device (Figure Number)	Location	Type of Ramp or Dock	Surface Conditions	Staging	Access	Remarks
			Concurrent with Rail Operations			
4 (Fig 41)	Various equipment motor pools	Bridge, arm veh launch AVLSC-60	Depends on site selected	Depends on site selected	Depends on site selected	May be used as a portable end loading ramp. These ramps are not included in the estimate of outloading capability as they are unit equipment.
Numerous (cut sloping ditch with bulldozer	Any graveled area	Sloping earth ditch	Depends on site selected	Depends on site selected	Depends site selected	These ramps will not be included in the estimate of outloading capability.
3 Forklifts, commercial, two 10,000-lb capacity and one 6,000-lb capacity	Mobile	N/A	Depends on site selected	Depends on site selected	Depends site selected	It is assumed that these forklifts are being used for loading railcars.
			Without Rail Operations			
10 above					See above	
3 above (forklifts)					See above	
5 (Fig 3)	Fort Drum Tracks 2, 3, 4, and 5	4 concrete end ramps and 1 concrete side ramp	Good	Yes	Good	
6	Fort Drum Tracks 19, 20, 21, 26, 31, and 32	Timber and earth with gravel surface	N/A	Yes	Good	These ramps would be constructed to meet mobilization requirements.

Figure 34. Concrete end-loading ramp, Oneida and Ontario Avenues.

Figure 35. Vehicle loading exercise using concrete end-loading ramp at Fort Drum.

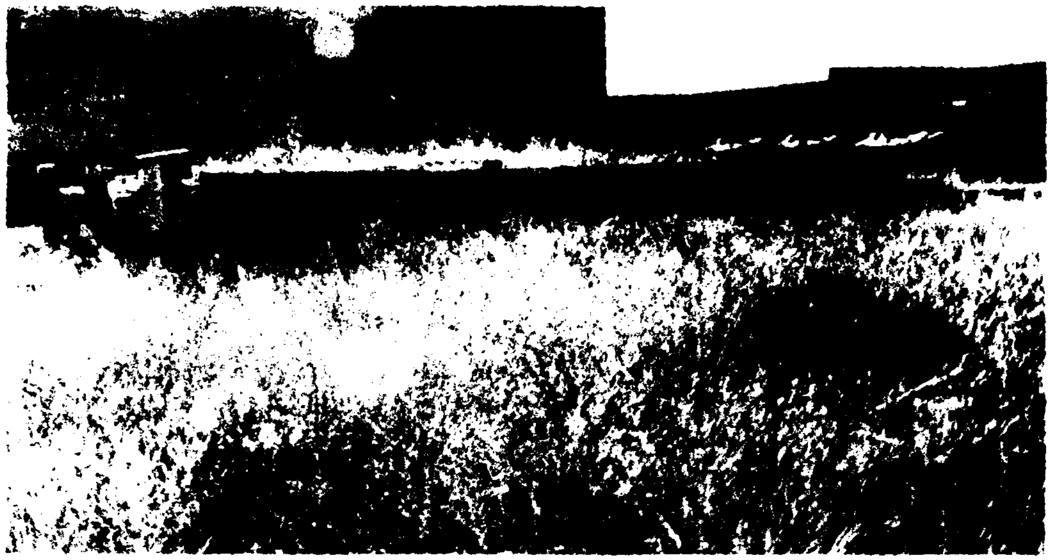


Figure 36. Timber and earth ramp, New Jersey NG MATES area.

Figure 37. Timber end ramp, maintenance area, 3rd St East and St. Lawrence.

Figure 38. Timber end ramp located near Building T97.

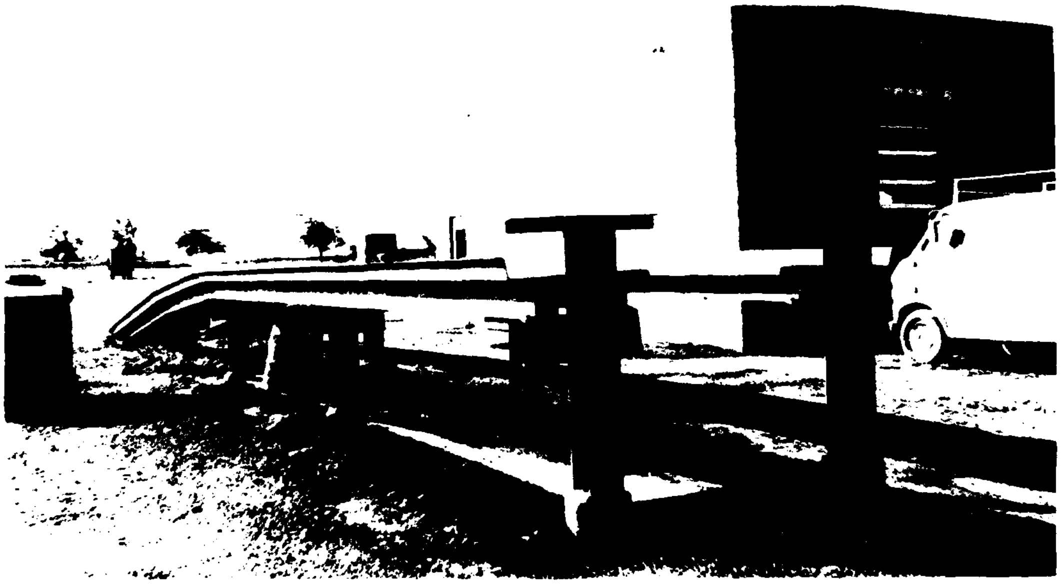


Figure 39. Grease rack near Building P3829.

Figure 40. M870 semitrailer, low-bed, 40-ton.

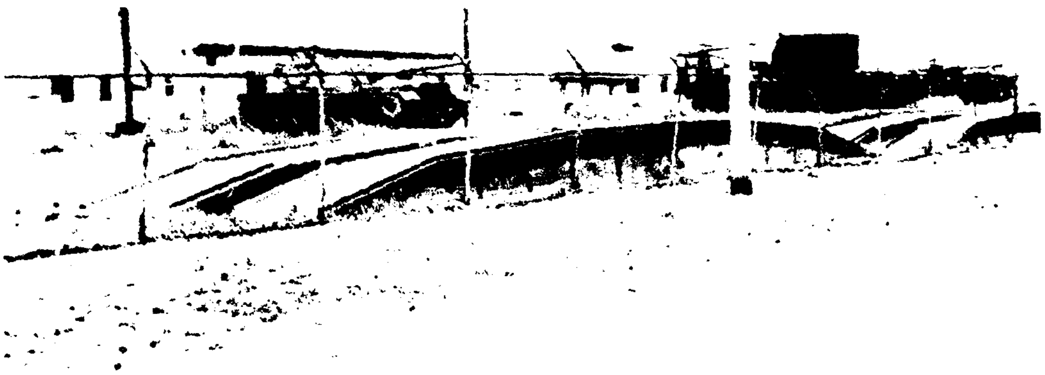


Figure 41. Bridge, armor, vehicle launch, AVLSC 60.

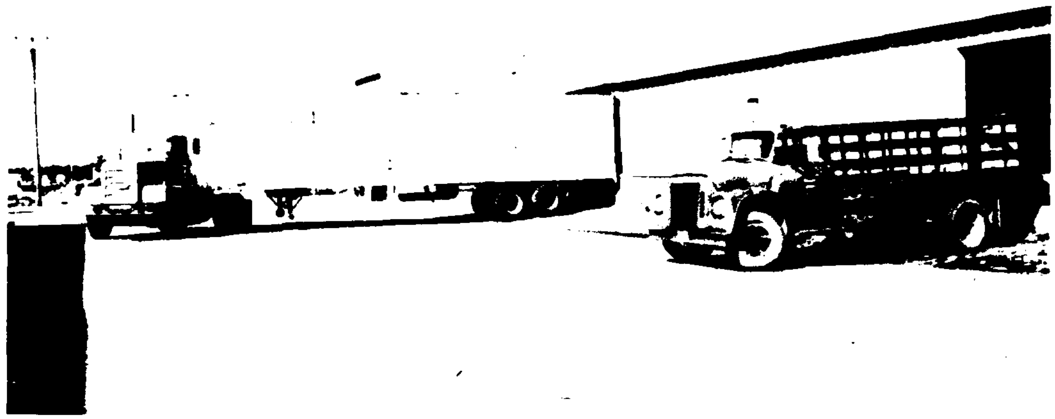


Figure 42. Van semitrailer loading, Building T97, Oswego Ave.

C. FLATBED SEMITRAILER OUTLOADING

The loading procedure could be as follows: A vehicle is driven up the ramp and onto the waiting semitrailer, temporary chocks are placed, and the loaded truck is driven slowly away from the ramp to a designated location where it is secured with tiedown chains. The next semitrailer is backed up to the ramp, and the procedure is repeated. Under this procedure, the ramp is not occupied while loaded vehicles are being secured. Using a conservative 60 minutes for each cycle, one semitrailer could be loaded per hour per ramp, or 10 vehicles per ramp per 10-hour shift. In most cases, 60 minutes would not be required.

1. Concurrent With Rail Operations

There are nine ramps with 10 outloading positions that could be used while rail operations are in progress. Using a 60-minute cycle per ramp, a 10-hour workday could produce 100 semitrailer loads, for daylight operation only. This does not include expedient means, such as excavating sloping ditches into which semitrailers could be backed for loading, nor the 6,000- and 10,000-pound commercial forklift trucks that could be used if not assigned to railcar loading, nor mobile cranes that also could be used. Numerous possibilities exist for increasing motor outloading facilities.

2. Without Rail Operations

If rail operations are not in progress, there are 20 loading ramps with 21 outloading positions to load commercial semitrailers. At 60 minutes per cycle per ramp, 210 semitrailers could be outloaded in a 10-hour workday. However, the possibility of obtaining 210 commercial semitrailers locally on any day seems highly unlikely. Therefore any constraint on Fort Drum's semitrailer outloading capability is not the lack of facilities, but the lack of semitrailers.

D. VAN SEMITRAILER OUTLOADING

The loading procedure could be as follows. A van is backed up to the loading platform, and cargo is transferred to the van from within an adjacent van or warehouse using one forklift per loading van. A cycle time of approximately 2-1/2 hours will be used to load a 40-foot van. Using this rate, one van could be loaded per 2-1/2 hours per position--or four vehicles per position per 10-hour shift.

At present, Fort Drum has 25 forklifts of the 2,000- to 4,000-pound size that could be utilized. This is less than the 39 loading positions available, thence the availability of forklifts is a constraint on van semitrailer outloading. At 2-1/2 hours per cycle per position, 100 vans could be outloaded in a 10-hour workday at Fort Drum.

VI. CONCLUSIONS

1. The condition of main line trackage in the vicinity will constrain any outloading operation, since much of the track is classified as Class 1 (estimated train time, Fort Drum to Bayonne, is 3 days).

2. Most of Fort Drum's railroad trackage is classified as Class 2 according to federal track safety standards. Certain sections of the rail trackage are classified as less than Class 1, mainly due to deteriorated ties.

3. The primary constraints limiting Fort Drum's rail outloading capability are the shortage of blocking and bracing materials, small handtools, bridgeplates, trained blocking and bracing crews, and a lack of out outloading plans.

4. End-loading ramps are needed for the six additional identified loading sites.

5. After the deficiencies noted above are corrected and upon receipt of a sufficient number of railcars to permit full-scale outloading, Fort Drum could achieve an outloading/receiving rate of 269 railcars per 24-hour period. At this rate, the division could be outloaded in 10 days. However, support-type units to be deployed during the same time frame will need to be outloaded (75 railcars per 24-hour period) at Watertown, New York, because Fort Drum's facilities will be fully utilized.

6. No costs for track repairs are indicated since Fort Drum's yearly track maintenance program for FY 79 should be adequate to replace decayed ties and upgrade those sections of track to Class 2. Costs for needed handtools, bridgeplates, and blocking and bracing material would be additional.

7. Empty railcars (dedicated train lengths) destined for Fort Drum should be positioned, in train-loading sequence, in Watertown.

8. The CONRAIL representatives did not express any reservations regarding the outloading of Fort Drum units. However, Fort Drum's transportation personnel should coordinate planning of impending outloading operations with the CONRAIL representatives at the earliest possible date.

9. For administrative-type moves, when leadtime is plentiful and costs must be considered, special-purpose railcars (such as bilevel auto-racks, trailer-on-flatcar (TOFC), and container-on-flatcar (COFC) cars) are more cost-effective than the standard types and should be used to the extent they are available.

10. For mobilization moves, when time is more critical than cost, the use of special-purpose railcars may not be possible because of the short leadtime and relatively short supply of these high-demand cars.

11. For concurrent rail and motor operations, 100 flatbed and 100 van semitrailers could be loaded per 10-hour day (for daylight operations only), and for separate operations 210 flatbed and 100 van semi-trailers could be loaded during the same period. This capability exceeds the probable local available supply of semitrailers.

12. The maximum curvature of the railroad tracks is 8 degrees. Consequently, any known length of railcar can be used on the installation.

VII. RECOMMENDATIONS

1. Upgrade the CONRAIL main line track to the east coast to a minimum Class 2 to reduce the probability of derailments and insure a more reliable response for mobilization readiness.

2. Undertake those items listed in section II, paragraph D4, "Physical Improvements and Additions." These improvements will provide a rail system capability of 269 railcars per 24-hour day as well as an effective rail system at Fort Drum.

3. Prepare a detailed unit outloading plan, using the simulation in appendix B as an example, that specifies unit assignments at loadout sites and movement functions.

4. Coordinate rail outloading plans with CONRAIL representatives at the earliest possible date.

5. Continue rail facility maintenance to insure an effective rail system.

6. Provide advance training for blocking and bracing crews.

7. Station road guards at all railroad crossings during outloading operations, and provide all train crewmen with walkie-talkies to insure a safer and more efficient operation.

8. Keep abreast of CONRAIL railroad maintenance plans.

9. Use special-purpose railcars (such as bilevel autoracks for small vehicles, TOFC cars for semitrailers and vans, and COFC cars for MILVANs) for administrative-type moves and, as available, for mobilization moves.

10. Provide warehousing for the blocking, bracing, and small tool supplies.

11. Coordinate with MTMC any removal of railroad track that is included in the mobilization outloading plan.

12. Construct any new track with a maximum curvature of 12 degrees.

APPENDIX A

TRACK SAFETY STANDARDS [5/]

PART 213—TRACK SAFETY STANDARDS

AUTHORITY: The provisions of this Part 213 issued under sections 202 and 209, 84 Stat. 971, 975; 45 U.S.C. 431 and 438 and § 1.49(n) of the Regulations of the Office of the Secretary of Transportation; 49 CFR 1.49(n).

SOURCE: The provisions of this Part 213 appear at 36 F.R. 20336, Oct. 20, 1971, unless otherwise noted.

Subpart A—General

§ 213.1 Scope of part.

This part prescribes initial minimum safety requirements for railroad track

[5/] Extracted from Title 49, Transportation, Parts 200 to 999, pp 8-19, Code of Federal Regulations, 1973.

that is part of the general railroad system of transportation. The requirements prescribed in this part apply to specific track conditions existing in isolation. Therefore, a combination of track conditions, none of which individually amounts to a deviation from the requirements in this part, may require remedial action to provide for safe operations over that track.

§ 213.3 Application.

(a) Except as provided in paragraphs (b) and (c) of this section, this part applies to all standard gage track in the general railroad system of transportation.

(b) This part does not apply to track—

(1) Located inside an installation which is not part of the general railroad system of transportation; or

(2) Used exclusively for rapid transit, commuter, or other short-haul passenger service in a metropolitan or suburban area.

(c) Until October 16, 1972, Subparts A, B, D (except § 213.109), E, and F of this part do not apply to track constructed or under construction before October 15, 1971. Until October 16, 1973, Subpart C and § 213.109 of Subpart D do not apply to track constructed or under construction before October 15, 1971.

§ 213.5 Responsibility of track owners.

(a) Any owner of track to which this part applies who knows or has notice that the track does not comply with the requirements of this part, shall—

(1) Bring the track into compliance; or

(2) Halt operations over that track.

(b) If an owner of track to which this part applies assigns responsibility for the track to another person (by lease or otherwise), any party to that assignment may petition the Federal Railroad Administrator to recognize the person to whom that responsibility is assigned for purposes of compliance with this part. Each petition must be in writing and include the following—

(1) The name and address of the track owner;

(2) The name and address of the person to whom responsibility is assigned (assignee);

(3) A statement of the exact relationship between the track owner and the assignee;

(4) A precise identification of the track;

(5) A statement as to the competence and ability of the assignee to carry out the duties of the track owner under this part; and

(6) A statement signed by the assignee acknowledging the assignment to him of responsibility for purposes of compliance with this part.

(c) If the Administrator is satisfied that the assignee is competent and able to carry out the duties and responsibilities of the track owner under this part, he may grant the petition subject to any conditions he deems necessary. If the Administrator grants a petition under this section, he shall so notify the owner and the assignee. After the Administrator grants a petition, he may hold the track owner or the assignee or both responsible for compliance with this part and subject to penalties under § 213.15.

§ 213.7 Designation of qualified persons to supervise certain renewals and inspect track.

(a) Each track owner to which this part applies shall designate qualified persons to supervise restorations and renewals of track under traffic conditions. Each person designated must have—

(1) At least—

(i) One year of supervisory experience in railroad track maintenance; or

(ii) A combination of supervisory experience in track maintenance and training from a course in track maintenance or from a college level educational program related to track maintenance;

(2) Demonstrated to the owner that he—

(i) Knows and understands the requirements of this part;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Written authorization from the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements in this part.

(b) Each track owner to which this part applies shall designate qualified persons to inspect track for defects. Each person designated must have—

(1) At least—

(i) One year of experience in railroad track inspection; or

(ii) A combination of experience in track inspection and training from a course in track inspection or from a college level educational program related to track inspection;

(2) Demonstrated to the owner that he—

(i) Knows and understands the requirements of this part;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Written authorization from the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements of this part, pending review by a qualified person designated under paragraph (a) of this section.

(c) With respect to designations under paragraphs (a) and (b) of this section, each track owner must maintain written records of—

(1) Each designation in effect;

(2) The basis for each designation, and

(3) Track inspections made by each designated qualified person as required by § 213.241.

These records must be kept available for inspection or copying by the Federal Railroad Administrator during regular business hours.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973]

§ 213.9 Classes of track: operating speed limits.

(a) Except as provided in paragraphs (b) and (c) of this section and §§ 213.57 (b), 213.59(a), 213.105, 213.113 (a) and (b), and 213.137 (b) and (c), the following maximum allowable operating speeds apply:

[In miles per hour]

Over track that meets all of the requirements prescribed in this part for—	The maximum allowable operating speed for freight trains is—	The maximum allowable operating speed for passenger trains is—
Class 1 track	10	15
Class 2 track	25	30
Class 3 track	40	60
Class 4 track	60	80
Class 5 track	80	90
Class 6 track	110	110

(b) If a segment of track does not meet all of the requirements for its intended class, it is reclassified to the next lowest class of track for which it does meet all of the requirements of this part. However, if it does not at least meet the requirements for class 1 track, no operations may be conducted over that segment except as provided in § 213.11.

(c) Maximum operating speed may not exceed 110 m.p.h. without prior approval of the Federal Railroad Administrator. Petitions for approval must be filed in the manner and contain the information required by § 211.11 of this chapter. Each petition must provide sufficient information concerning the performance characteristics of the track, signaling, grade crossing protection, trespasser control where appropriate, and equipment involved and also concerning maintenance and inspection practices and procedures to be followed, to establish that the proposed speed can be sustained in safety.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973; 38 FR 23405, Aug. 30, 1973]

§ 213.11 Restoration or renewal of track under traffic conditions.

If, during a period of restoration or renewal, track is under traffic conditions and does not meet all of the requirements prescribed in this part, the work and operations on the track must be under the continuous supervision of a person designated under § 213.7(a).

§ 213.13 Measuring track not under load.

When unloaded track is measured to determine compliance with requirements of this part, the amount of rail movement, if any, that occurs while the track is loaded must be added to the measurement of the unloaded track.

[38 FR 875, Jan. 5, 1973]

§ 213.15 Civil penalty.

(a) Any owner of track to which this part applies, or any person held by the Federal Railroad Administrator to be responsible under § 213.5(c), who violates any requirement prescribed in this part is subject to a civil penalty of at least $250 but not more than $2,500.

(b) For the purpose of this section, each day a violation persists shall be treated as a separate offense.

Exemptions.

(a) Any owner of track to which this part applies may petition the Federal Railroad Administrator for exemption from any or all requirements prescribed in this part.

(b) Each petition for exemption under this section must be filed in the manner and contain the information required by § 211.11 of this chapter.

(c) If the Administrator finds that an exemption is in the public interest and is consistent with railroad safety, he may grant the exemption subject to any conditions he deems necessary. Notice of each exemption granted is published in the FEDERAL REGISTER together with a statement of the reasons therefor.

Subpart B—Roadbed

§ 213.31 Scope.

This subpart prescribes minimum requirements for roadbed and areas immediately adjacent to roadbed.

§ 213.33 Drainage.

Each drainage or other water carrying facility under or immediately adjacent to the roadbed must be maintained and kept free of obstruction, to accommodate expected water flow for the area concerned.

§ 213.37 Vegetation.

Vegetation on railroad property which is on or immediately adjacent to roadbed must be controlled so that it does not—

(a) Become a fire hazard to track-carrying structures;

(b) Obstruct visibility of railroad signs and signals;

(c) Interfere with railroad employees performing normal trackside duties;

(d) Prevent proper functioning of signal and communication lines; or

(e) Prevent railroad employees from visually inspecting moving equipment from their normal duty stations.

Subpart C—Track Geometry

§ 213.51 Scope.

This subpart prescribes requirements for the gage, alinement, and surface of track, and the elevation of outer rails and speed limitations for curved track.

§ 213.53 Gage.

(a) Gage is measured between the heads of the rails at right angles to the rails in a plane five-eighths of an inch below the top of the rail head.

(b) Gage must be within the limits prescribed in the following table:

Class of track	The gage of tangent track must be—		The gage of curved track must be—	
	At least—	But not more than—	At least—	But not more than—
1	4′ 8″	4′ 9¾″	4′ 8″	4′ 9¾″
2 and 3	4′ 8″	4′ 9½″	4′ 8″	4′ 9¾″
4	4′ 8″	4′ 9¼″	4′ 8″	4′ 9½″
5	4′ 8″	4′ 9″	4′ 8″	4′ 9½″
6	4′ 8″	4′ 8¾″	4′ 8″	4′ 9″

§ 213.55 Alinement.

Alinement may not deviate from uniformity more than the amount prescribed in the following table:

Class of track	Tangent track	Curved track
	The deviation of the mid-offset from 62-foot line [1] may not be more than—	The deviation of the mid-ordinate from 62-foot chord [2] may not be more than—
1	5″	5″
2	3″	3″
3	1¾″	1¾″
4	1½″	1½″
5	¾″	⅝″
6	½″	⅜″

[1] The ends of the line must be at points on the gage side of the line rail, five eighths of an inch below the top of the railhead. Either rail may be used as the line rail, however, the same rail must be used for the full length of that tangential segment of track.

[2] The ends of the chord must be at points on the gage side of the outer rail, five-eighths of an inch below the top of the railhead.

§ 213.57 Curves; elevation and speed limitations.

(a) Except as provided in § 213.63, the outside rail of a curve may not be lower than the inside rail or have more than 6 inches of elevation.

(b) The maximum allowable operating speed for each curve is determined by the following formula:

$$V_{max} = \sqrt{\frac{E_a + 3}{0.0007d}}$$

where

V_{max} = Maximum allowable operating speed (miles per hour).

E_a = Actual elevation of the outside rail (inches).

d = Degree of curvature (degrees).

Appendix A is a table of maximum allowable operating speed computed in accordance with this formula for various elevations and degrees of curvature.

§ 213.59 Elevation of curved track; runoff.

(a) If a curve is elevated, the full elevation must be provided throughout the curve, unless physical conditions do not permit. If elevation runoff occurs in a curve, the actual minimum elevation must be used in computing the maximum allowable operating speed for that curve under § 213.57(b).

(b) Elevation runoff must be at a uniform rate, within the limits of track surface deviation prescribed in § 213.63, and it must extend at least the full length of the spirals. If physical conditions do not permit a spiral long enough to accommodate the minimum length of runoff, part of the runoff may be on tangent track.

§ 213.61 Curve data for Classes 4 through 6 track.

(a) Each owner of track to which this part applies shall maintain a record of each curve in its Classes 4 through 6 track. The record must contain the following information:

(1) Location;
(2) Degree of curvature;
(3) Designated elevation;
(4) Designated length of elevation runoff; and
(5) Maximum allowable operating speed.

[38 FR 875, Jan. 5, 1973]

§ 213.63 Track surface.

Each owner of the track to which this part applies shall maintain the surface of its track within the limits prescribed in the following table:

Track surface	Class of track					
	1	2	3	4	5	6
The runoff in any 31 feet of rail at the end of a raise may not be more than	3½″	3″	2″	1½″	1″	½″
The deviation from uniform profile on either rail at the midordinate of a 62-foot chord may not be more than	3″	2¾″	2¼″	2″	1¼″	½″
Deviation from designated elevation on spirals may not be more than	1¾″	1½″	1¼″	1″	¾″	½″
ariation in cross level on spirals in any 31 feet may not be more than	2″	1¾″	1¼″	1″	¾″	½″
Deviation from zero cross level at any point on tangent or from designated elevation on curves between spirals may not be more than	3″	2″	1¾″	1¼″	1″	½″
The difference in cross level between any two points less than 62 feet apart on tangents and curves between spirals may not be more than	3″	2″	1¾″	1¼″	1″	½″

Subpart D—Track Structure

§ 213.101 Scope.

This subpart prescribes minimum requirements for ballast, crossties, track assembly fittings, and the physical condition of rails.

§ 213.103 Ballast; general.

Unless it is otherwise structurally supported, all track must be supported by material which will—

(a) Transmit and distribute the load of the track and railroad rolling equipment to the subgrade;

(b) Restrain the track laterally, longitudinally, and vertically under dynamic loads imposed by railroad rolling equipment and thermal stress exerted by the rails;

(c) Provide adequate drainage for the track; and

(d) Maintain proper track crosslevel, surface, and alinement.

§ 213.105 Ballast; disturbed track.

If track is disturbed, a person designated under § 213.7 shall examine the track to determine whether or not the ballast is sufficiently compacted to perform the functions described in § 213.103. If the person making the examination considers it to be necessary in the interest of safety, operating speed over the disturbed segment of track must be

reduced to a speed that he considers safe.

§ 213.109 Crossties.

(a) Crossties may be made of any material to which rails can be securely fastened. The material must be capable of holding the rails to gage within the limits prescribed in § 213.53(b) and distributing the load from the rails to the ballast section.

(b) A timber crosstie is considered to be defective when it is—

(1) Broken through;

(2) Split or otherwise impaired to the extent it will not hold spikes or will allow the ballast to work through;

(3) So deteriorated that the tie plate or base of rail can move laterally more than one-half inch relative to the crosstie;

(4) Cut by the tie plate through more than 40 percent of its thickness; or

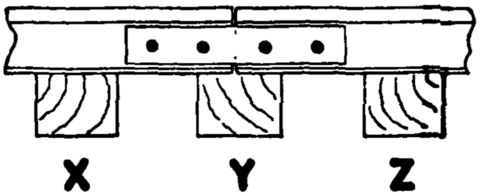
(5) Not spiked as required by § 213.127.

(c) If timber crossties are used, each 39 feet of track must be supported by nondefective ties as set forth in the following table:

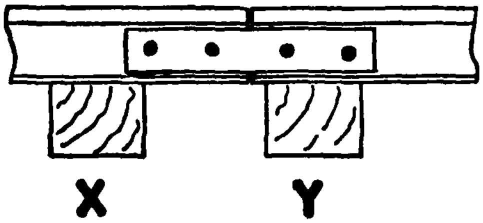
Class of track	Minimum number of nondefective ties per 39 feet of track	Maximum distance between nondefective ties (center to center) (inches)
1	5	100
2, 3	8	70
4, 5	12	48
6	14	48

(d) If timber ties are used, the minimum number of nondefective ties under a rail joint and their relative positions under the joint are described in the following chart. The letters in the chart correspond to letters underneath the ties for each type of joint depicted.

SUPPORTED JOINT



SUSPENDED JOINT



Class of track	Minimum number of nondefective ties under a joint	Required position of nondefective ties	
		Supported joint	Suspended joint
1	1	X, Y, or Z	X or Y.
2, 3	1	Y	X or Y.
4, 5, 6	2	X and Y, or Y and Z.	X and Y.

(e) Except in an emergency or for a temporary installation of not more than 6-months duration, crossties may not be interlaced to take the place of switch ties.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973]

§ 213.113 Defective rails.

(a) When an owner of track to which this part applies learns, through inspection or otherwise, that a rail in that track contains any of the defects listed in the following table, a person designated under § 213.7 shall determine whether or not the track may continue in use. If he determines that the track may continue in use, operation over the defective rail is not permitted until—

(1) The rail is replaced; or

(2) The remedial action prescribed in the table is initiated:

REMEDIAL ACTION

Defect	Length of defect (inch) — More than	Length of defect (inch) — But not more than	Percent of railhead cross-sectional area weakened by defect — Less than	Percent of railhead cross-sectional area weakened by defect — But not less than	If defective rail is not replaced, take the remedial action prescribed in note—
Transverse fissure			20		B.
			100	20	B.
				100	A.
Compound fissure			20		B.
			100	20	B.
				100	A.
Detail fracture Engine burn fracture Defective weld			20		C.
			100	20	D.
				100	A, or E and H.
Horizontal split head Vertical split head	0	2			H and F.
	2	4			I and G.
	4				B.
	(Break out in railhead)				A.
Split web Piped rail Head web separation	0	½			H and F.
	½	3			I and G.
	3				B.
	(Break out in railhead)				A.
Bolt hole crack	0	½			H and F.
	½	1½			I and G.
	1½				B.
	(Break out in railhead)				A.
Broken base	0	6			E and I.
	6				(Replace rail).
Ordinary break					A or E.
Damaged rail					C.

NOTE:
A—Assign person designated under § 213.7 to visually supervise each operation over defective rail.
B—Limit operating speed to 10 m.p.h. over defective rail.
C—Apply joint bars bolted only through the outermost holes to defect within 20 days after it is determined to continue the track in use. In the case of classes 3 through 6 track, limit operating speed over defective rail to 30 m.p.h. until angle bars are applied; thereafter, limit speed to 50 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned, whichever is lower.
D—Apply joint bars bolted only through the outermost holes to defect within 10 days after it is determined to continue the track in use. Limit operating speed over defective rail to 10 m.p.h. until angle bars are applied; *thereafter, limit speed to 50 m.p.h. or the maximum allowable speed under § 213.9* for the class of track concerned, whichever is lower.
E—Apply joint bars to defect and bolt in accordance with § 213.121 (d) and (e).
F—Inspect rail 90 days after it is determined to continue the track in use.
G—Inspect rail 30 days after it is determined to continue the track in use.
H—Limit operating speed over defective rail to 50 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned, whichever is lower.
I—Limit operating speed over defective rail to 30 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned, whichever is lower.

(b) If a rail in classes 3 through 6 track or class 2 track on which passenger trains operate evidences any of the conditions listed in the following table, the remedial action prescribed in the table must be taken:

Condition	Remedial action — *If a person* designated under § 213.7 determines that condition requires rail to be replaced	Remedial action — *If a person* designated under § 213.7 determines that condition does not require rail to be replaced
Shelly spots Head checks Engine burn (but not fracture). Mill defect	Limit speed to 20 m.p.h. and schedule the rail for replacement.	Inspect the rail for internal defects at intervals of not more than every 12 months.
Flaking Slivered Corrugated Corroded	do	Inspect the rail at intervals of not more than every 6 months.

(c) As used in this section—

(1) "Transverse Fissure" means a progressive crosswise fracture starting from a crystalline center or nucleus inside the head from which it spreads outward as a smooth, bright, or dark, round or oval surface substantially at a right angle to the length of the rail. The distinguishing features of a transverse fissure from other types of fractures or defects are the crystalline center or nucleus and the nearly smooth surface of the development which surrounds it.

(2) "Compound Fissure" means a progressive fracture originating in a horizontal split head which turns up or down in the head of the rail as a smooth, bright, or dark surface progressing until substantially at a right angle to the length of the rail. Compound fissures require examination of both faces of the fracture to locate the horizontal split head from which they originate.

(3) "Horizontal Split Head" means a horizontal progressive defect originating inside of the rail head, usually one-quarter inch or more below the running surface and progressing horizontally in all directions, and generally accompanied by a flat spot on the running surface. The defect appears as a crack lengthwise of the rail when it reaches the side of the rail head.

(4) "Vertical Split Head" means a vertical split through or near the middle of the head, and extending into or through it. A crack or rust streak may show under the head close to the web or pieces may be split off the side of the head.

(5) "Split Web" means a lengthwise crack along the side of the web and extending into or through it.

(6) "Piped Rail" means a vertical split in a rail, usually in the web, due to failure of the sides of the shrinkage cavity in the ingot to unite in rolling.

(7) "Broken Base" means any break in the base of a rail.

(8) "Detail Fracture" means a progressive fracture originating at or near the surface of the rail head. These fractures should not be confused with transverse fissures, compound fissures, or other defects which have internal origins. Detail fractures may arise from shelly spots, head checks, or flaking.

(9) "Engine Burn Fracture" means a progressive fracture originating in spots where driving wheels have slipped on top of the rail head. In developing downward they frequently resemble the compound or even transverse fissure with which they should not be confused or classified.

(10) "Ordinary Break" means a partial or complete break in which there is no sign of a fissure, and in which none of the other defects described in this paragraph are found.

(11) "Damaged rail" means any rail broken or injured by wrecks, broken, flat, or unbalanced wheels, slipping, or similar causes.

(12) "Shelly spots" means a condition where a thin (usually three-eighths inch in depth or less) shell-like piece of surface metal becomes separated from the parent metal in the railhead, generally at the gage corner. It may be evidenced by a black spot appearing on the railhead over the zone of separation or a piece of metal breaking out completely, leaving a shallow cavity in the railhead. In the case of a small shell there may be no surface evidence, the existence of the shell being apparent only after the rail is broken or sectioned.

(13) "Head checks" mean hair fine cracks which appear in the gage corner of the rail head, at any angle with the length of the rail. When not readily visible the presence of the checks may often be detected by the raspy feeling of their sharp edges.

(14) "Flaking" means small shallow flakes of surface metal generally not more than one-quarter inch in length or width break out of the gage corner of the railhead.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973; 38 FR 1508, Jan. 15, 1973]

§ 213.115 Rail end mismatch.

Any mismatch of rails at joints may not be more than that prescribed by the following table:

Class of track	Any mismatch of rails at joints may not be more than the following—	
	On the trend of the rail ends (inch)	On the gage side of the rail ends (inch)
1	1/4	1/4
2	1/4	3/16
3	3/16	3/16
4, 5	1/8	1/8
6	1/8	1/8

§ 213.117 Rail end batter.

(a) Rail end batter is the depth of depression at one-half inch from the rail end. It is measured by placing an 18-inch straightedge on the tread on the rail end, without bridging the joint, and measuring the distance between the bottom of the straightedge and the top of the rail at one-half inch from the rail end.

(b) Rail end batter may not be more than that prescribed by the following table:

Class of track	*Rail end batter may not be more than— (inch)*
1	1/2
2	3/8
3	3/8
4	1/4
5	1/8
6	1/8

§ 213.119 Continuous welded rail.

(a) When continuous welded rail is being installed, it must be installed at, or adjusted for, a rail temperature range

that should not result in compressive or tensile forces that will produce lateral displacement of the track or pulling apart of rail ends or welds.

(b) After continuous welded rail has been installed it should not be disturbed at rail temperatures higher than its installation or adjusted installation temperature.

§ 213.121 Rail joints.

(a) Each rail joint, insulated joint, and compromise joint must be of the proper design and dimensions for the rail on which it is applied.

(b) If a joint bar on classes 3 through 6 track is cracked, broken, or because of wear allows vertical movement of either rail when all bolts are tight, it must be replaced.

(c) If a joint bar is cracked or broken between the middle two bolt holes it must be replaced.

(d) In the case of conventional jointed track, each rail must be bolted with at least two bolts at each joint in classes 2 through 6 track, and with at least one bolt in class 1 track.

(e) In the case of continuous welded rail track, each rail must be bolted with at least two bolts at each joint.

(f) Each joint bar must be held in position by track bolts tightened to allow the joint bar to firmly support the abutting rail ends and to allow longitudinal movement of the rail in the joint to accommodate expansion and contraction due to temperature variations. When out-of-face, no-slip, joint-to-rail contact exists by design, the requirements of this paragraph do not apply. Those locations are considered to be continuous welded rail track and must meet all the requirements for continuous welded rail track prescribed in this part.

(g) No rail or angle bar having a torch cut or burned bolt hole may be used in classes 3 through 6 track.

§ 213.123 Tie plates.

(a) In classes 3 through 6 track where timber crossties are in use there must be tie plates under the running rails on at least eight of any 10 consecutive ties.

(b) Tie plates having shoulders must be placed so that no part of the shoulder is under the base of the rail.

§ 213.125 Rail anchoring.

Longitudinal rail movement must be effectively controlled. If rail anchors which bear on the sides of ties are used for this purpose, they must be on the same side of the tie on both rails.

§ 213.127 Track spikes.

(a) When conventional track is used with timber ties and cut track spikes, the rails must be spiked to the ties with at least one line-holding spike on the gage side and one line-holding spike on the field side. The total number of track spikes per rail per tie, including plate-holding spikes, must be at least the number prescribed in the following table:

MINIMUM NUMBER OF TRACK SPIKES PER RAIL PER TIE, INCLUDING PLATE-HOLDING SPIKES

Class of track	Tangent track and curved track with not more than 2° of curvature	Curved track with more than 2° but not more than 4° of curvature	Curved track with more than 4° but not more than 6° of curvature	Curved track with more than 6° of curvature
1	2	2	2	2
2	2	2	2	3
3	2	2	2	3
4	2	2	3	----------
5	2	3	----------	----------
6	2	----------	----------	----------

(b) A tie that does not meet the requirements of paragraph (a) of this section is considered to be defective for the purposes of § 213.109(b).

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.129 Track shims.

(a) If track does not meet the geometric standards in Subpart C of this part and working of ballast is not possible due to weather or other natural conditions, track shims may be installed to correct the deficiencies. If shims are used, they must be removed and the track resurfaced as soon as weather and other natural conditions permit.

(b) When shims are used they must be—

(1) At least the size of the tie plate;

(2) Inserted directly on top of the tie, beneath the rail and tie plate;

(3) Spiked directly to the tie with spikes which penetrate the tie at least 4 inches.

(c) When a rail is shimmed more than 1½ inches, it must be securely braced on at least every third tie for the full length of the shimming.

(d) When a rail is shimmed more than 2 inches a combination of shims and 2-

inch or 4-inch planks, as the case may be, must be used with the shims on top of the planks.

§ 213.131 Planks used in shimming.

(a) Planks used in shimming must be at least as wide as the tie plates, but in no case less than 5½ inches wide. Whenever possible they must extend the full length of the tie. If a plank is shorter than the tie, it must be at least 3 feet long and its outer end must be flush with the end of the tie.

(b) When planks are used in shimming on uneven ties, or if the two rails being shimmed heave unevenly, additional shims may be placed between the ties and planks under the rails to compensate for the unevenness.

(c) Planks must be nailed to the ties with at least four 8-inch wire spikes. Before spiking the rails or shim braces, planks must be bored with ⅝-inch holes.

§ 213.133 Turnouts and track crossings generally.

(a) In turnouts and track crossings, the fastenings must be intact and maintained so as to keep the components securely in place. Also, each switch, frog, and guard rail must be kept free of obstructions that may interfere with the passage of wheels.

(b) Classes 4 through 6 track must be equipped with rail anchors through and on each side of track crossings and turnouts, to restrain rail movement affecting the position of switch points and frogs.

(c) Each flangeway at turnouts and track crossings must be at least 1½ inches wide.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.135 Switches.

(a) Each stock rail must be securely seated in switch plates, but care must be used to avoid canting the rail by overtightening the rail braces.

(b) Each switch point must fit its stock rail properly, with the switch stand in either of its closed positions to allow wheels to pass the switch point. Lateral and vertical movement of a stock rail in the switch plates or of a switch plate on a tie must not adversely affect the fit of the switch point to the stock rail.

(c) Each switch must be maintained so that the outer edge of the wheel tread cannot contact the gage side of the stock rail.

(d) The heel of each switch rail must be secure and the bolts in each heel must be kept tight.

(e) Each switch stand and connecting rod must be securely fastened and operable without excessive lost motion.

(f) Each throw lever must be maintained so that it cannot be operated with the lock or keeper in place.

(g) Each switch position indicator must be clearly visible at all times.

(h) Unusually chipped or worn switch points must be repaired or replaced. Metal flow must be removed to insure proper closure.

§ 213.137 Frogs.

(a) The flangeway depth measured from a plane across the wheel-bearing area of a frog on class 1 track may not be less than 1⅜ inches, or less than 1½ inches on classes 2 through 6 track.

(b) If a frog point is chipped, broken, or worn more than five-eighths inch down and 6 inches back, operating speed over that frog may not be more than 10 miles per hour.

(c) If the tread portion of a frog casting is worn down more than three-eighths inch below the original contour, operating speed over that frog may not be more than 10 miles per hour.

§ 213.139 Spring rail frogs.

(a) The outer edge of a wheel tread may not contact the gage side of a spring wing rail.

(b) The toe of each wing rail must be solidly tamped and fully and tightly bolted.

(c) Each frog with a bolt hole defect or head-web separation must be replaced.

(d) Each spring must have a tension sufficient to hold the wing rail against the point rail.

(e) The clearance between the hold-down housing and the horn may not be more than one-fourth of an inch.

§ 213.141 Self-guarded frogs.

(a) The raised guard on a self-guarded frog may not be worn more than three-eighths of an inch.

(b) If repairs are made to a self-guarded frog without removing it from service, the guarding face must be restored before rebuilding the point.

§ 213.143 Frog guard rails and guard faces; gage.

The guard check and guard face gages in frogs must be within the limits prescribed in the following table:

Class of track	Guard check gage — The distance between the gage line of a frog to the guard line [1] of its guard rail or guarding face, measured across the track at right angles to the gage line, [2] may not be less than—	Guard face gage — The distance between guard lines, [1] measured across the track at right angles to the gage line, [2] may not be more than—
1	4′ 6⅛″	4′ 5¼″
2	4′ 6¼″	4′ 5⅛″
3, 4	4′ 6⅜″	4′ 5⅛″
5, 6	4′ 6½″	4′ 5″

[1] A line along that side of the flangeway which is nearer to the center of the track and at the same elevation as the gage line.
[2] A line ⅝ inch below the top of the center line of the head of the running rail, or corresponding location of the tread portion of the track structure.

Subpart E—Track Appliances and Track-Related Devices

§ 213.201 Scope.

This subpart prescribes minimum requirements for certain track appliances and track-related devices.

§ 213.205 Derails.

(a) Each derail must be clearly visible. When in a locked position a derail must be free of any lost motion which would allow it to be operated without removing the lock.

(b) When the lever of a remotely controlled derail is operated and latched it must actuate the derail.

§ 213.207 Switch heaters.

The operation of a switch heater must not interfere with the proper operation of the switch or otherwise jeopardize the safety of railroad equipment.

Subpart F—Inspection

§ 213.231 Scope.

This subpart prescribes requirements for the frequency and manner of inspecting track to detect deviations from the standards prescribed in this part.

§ 213.233 Track inspections.

(a) All track must be inspected in accordance with the schedule prescribed in paragraph (c) of this section by a person designated under § 213.7.

(b) Each inspection must be made on foot or by riding over the track in a vehicle at a speed that allows the person making the inspection to visually inspect the track structure for compliance with this part. However, mechanical or electrical inspection devices approved by the Federal Railroad Administrator may be used to supplement visual inspection. If a vehicle is used for visual inspection, the speed of the vehicle may not be more than 5 miles per hour when passing over track crossings, highway crossings, or switches.

(c) Each track inspection must be made in accordance with the following schedule:

Class of track	Type of track	Required frequency
1, 2, 3	Main track and sidings.	*Weekly* with at least 3 calendar days interval between inspections, or *before use*, if the track is used less than once a week, or *twice weekly* with at least 1 calendar day interval between inspections, if the track carries passenger trains or more than 10 million gross tons of traffic during the preceding calendar year.
1, 2, 3	Other than main track and sidings.	*Monthly* with at least 20 calendar days interval between inspections.
4, 5, 6		*Twice weekly* with at least 1 calendar day interval between inspections.

(d) If the person making the inspection finds a deviation from the requirements of this part, he shall immediately initiate remedial action.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.235 Switch and track crossing inspections.

(a) Except as provided in paragraph (b) of this section, each switch and track crossing must be inspected on foot at least monthly.

(b) In the case of track that is used less than once a month, each switch and track crossing must be inspected on foot before it is used.

§ 213.237 Inspection of rail.

(a) In addition to the track inspections required by § 213.233, at least once a

year a continuous search for internal defects must be made of all jointed and welded rails in Classes 4 through 6 track, and Class 3 track over which passenger trains operate. However, in the case of a new rail, if before installation or within 6 months thereafter it is inductively or ultrasonically inspected over its entire length and all defects are removed, the next continuous search for internal defects need not be made until 3 years after that inspection.

(b) Inspection equipment must be capable of detecting defects between joint bars, in the area enclosed by joint bars.

(c) Each defective rail must be marked with a highly visible marking on both sides of the web and base.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.239 Special inspections.

In the event of fire, flood, severe storm, or other occurrence which might have damaged track structure, a special inspection must be made of the track involved as soon as possible after the occurrence.

§ 213.241 Inspection records.

(a) Each owner of track to which this part applies shall keep a record of each inspection required to be performed on that track under this subpart.

(b) Each record of an inspection under §§ 213.233 and 213.235 shall be prepared on the day the inspection is made and signed by the person making the inspection. Records must specify the track inspected, date of inspection, location and nature of any deviation from the requirements of this part, and the remedial action taken by the person making the inspection. The owner shall retain each record at its division headquarters for at least 1 year after the inspection covered by the record.

(c) Rail inspection records must specify the date of inspection, the location, and nature of any internal rail defects found, and the remedial action taken and the date thereof. The owner shall retain a rail inspection record for at least 2 years after the inspection and for 1 year after remedial action is taken.

(d) Each owner required to keep inspection records under this section shall make those records available for inspection and copying by the Federal Railroad Administrator.

Appendix A—Maximum Allowable Operating Speeds for Curved Track

Elevation of outer rail (inches)

Degree of Curvature	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
	Maximum allowable operating speed (mph)												
0°30′	93	100	107										
0°40′	80	87	93	98	103	109							
0°50′	72	78	83	88	93	97	101	106	110				
1°00′	66	71	76	80	85	89	93	96	100	104	107	110	
1°15′	59	63	68	72	76	79	83	86	89	93	96	99	101
1°30′	54	58	62	66	69	72	76	79	82	85	87	90	93
1°45′	50	54	57	61	64	67	70	73	76	78	81	83	86
2°00′	46	50	54	57	60	63	66	68	71	73	76	78	80
2°15′	44	47	50	54	56	59	62	64	67	69	71	74	76
2°30′	41	45	48	51	54	56	59	61	63	66	68	70	72
2°45′	40	43	46	48	51	54	56	58	60	62	65	66	68
3°00′	38	41	44	46	49	51	54	56	58	60	62	64	66
3°15′	36	39	42	45	47	49	51	54	56	57	59	61	63
3°30′	35	38	40	43	45	47	50	52	54	55	57	59	61
3°45′	34	37	39	41	44	46	48	50	52	54	55	57	59
4°00′	33	35	38	40	42	44	46	48	50	52	54	55	57
4°30′	31	33	36	38	40	42	44	45	47	49	50	52	54
5°00′	29	32	34	36	38	40	41	43	45	46	48	49	51
5°30′	28	30	32	34	36	38	40	41	43	44	46	47	48
6°00′	27	29	31	33	35	36	38	39	41	42	44	45	46
6°30′	26	[illegible]	30	31	33	35	36	38	39	41	42	43	45
7°00′	25	27	29	30	32	34	35	36	38	39	40	42	43
8°00′	23	25	27	28	30	31	33	34	35	37	38	39	40
9°00′	22	24	25	27	28	30	31	32	33	35	36	37	38
10°00′	21	22	24	25	27	28	29	31	32	33	34	35	36
11°00′	20	21	23	24	26	27	28	29	30	31	32	33	34
12°00′	19	20	22	23	24	26	27	28	29	30	31	32	3

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

APPENDIX B

PROPOSED RAIL OUTLOADING PROCEDURE FOR A MOBILIZATION MOVE AT FORT DRUM

Maximum rail outloading operations use a cyclic schedule to minimize conflicts and improve control. The recommended outloading plan, Plan 6, is similar to the maximum plan shown in figure 43 and described below. All plans shown in the capability matrix (table 4) follow the same basic idea, with greater outloading capability requiring more effort and greater cost. The simulation begins with the assumption that it takes several days to accumulate the necessary railcars to start full-scale outloading operations. The 120-ton locomotives position the arriving railcars at the designated loadout sites, according to a preconceived plan. Simultaneously, the equipment to be loaded aboard the cars is prepared and staged. Personnel should be used to throw switches and act as road guards at all crossings to reduce delay and insure a safer operation.

Initial conditions are as follows: Empty railcars have been accumulating for several days and have been spotted at all loading sites, tracks L1 through L14. The number of cars in position is 269. Incoming railcars, loaded with unit equipment, may be spotted at E4, S1, or S2. The number of incoming loaded railcars during peak outloading is 10. Approximately this many railcars are expected to arrive at Fort Drum during the entire outloading operation and are not expected to cause any interruptions. The general operation plan is that the loading sites, previously mentioned, will be used for loading on a cyclic basis.

When the unit equipment is loaded on the railcars, 120-ton locomotives will begin coupling railcars to form the respective train loads, and will begin switching operations to position both loaded and empty cars. One locomotive will remain at Fort Drum for switching operations. The other locomotives will assist in some switching operations but mainly will be used to couple their respective loads and transport them to the designated POE. An additional locomotive may be positioned at Fort Drum to reduce the switching times, but this may not be possible due to other railroad priorities associated with mobilization.

Loading, blocking, and bracing of the empty cars at the loading sites will be accomplished during daylight hours and will be assumed to last about 7 hours. The switching operations will follow and will be carried out until they are completed. This proposed rail outloading procedure is considered the mo-t economical.

Prior to the start of the outloading (7th hour), the first train of empties, consisting of four 120-ton locomotives, 134 flatcars, and 2 cabooses,

LEGEND	
C	COUPLE
UC	UNCOUPLE
TR	TRANSIT
L	LOADED
MN	MAIN
WT	WAIT
SB	SET BRAKES
TRK	TRACK
20	EMPTY CARS
SL	SWITCHING LOCOMOTIVE
ML	MAINLINE LOCOMOTIVE
FLT	FLATCAR
BOX	BOXCAR
E	EMPTY

TIME ELASPED IN HOURS SINCE LOADING, BLOCKING & BREAKING BEGAN

7

FIRST TRAIN ARRIVES WITH 4 120 TON LOCOMOTIVES, 134 FLTS, 2 CABOOSES AND POSITIONS THESE EMPTIES ALONG TRK E1 PRIOR TO START OF OUTLOADING (SEE NOTE) CABOOSES ARE PLACED ON E4 (SPUR TRACK 24)

OPERATION	C-29-L (RB)	TR	C-
TIME (MINUTES)	(30)	(6)	
TRACK (LOCATION)	L1	L2	
NUMBER OF RAILCARS	29	29	

SECOND TRAIN (4 120 TON LOCOMOTIVES) IS POSITIONED INITIALLY ON E AND ASSISTS IN SWITCHING BEFORE COUPLING TO FIRST LOAD AFTER FIRST TRAIN DEPARTS FT DRUM

NOTES:

FIRST TRAIN BRINGS IT'S LOAD TO THE BEGINING OF FT DRUM'S WYE AND STOPS. THE ENTIRE TRAIN CAN BE ACCOMMODATED ON THE 3.5 TRACK LEADING INTO FT DRUM FROM THE WYE OFF THE CONRAIL MAIN LINE HEADING TOWARD WATERTOWN. THE 120-TON LOCOMOTIVES THEN BREAK UP THE TRAIN INTO 46, 45 AND 45 CAR SECTIONS AND POSITION THE EMPTIES RESPECTIVELY ON TRACK E1. SECOND TRAIN (CONSISTING OF ONLY 4 120-TON LOCOMOTIVES) FOLLOWS BEHIND FIRST TRAIN AND CAN PUSH THE LAST SECTION OF 43 CARS AND 2 CABOOSES ONTO E1 AND E4. THE ENGINES WILL USE LADDER TRACKS 17 AND 18 AND THE END PORTION OF 2 FOR ENTRY INTO FT DRUM AND REVERSING INTO E1. AFTER POSITIONING THE EMPTIES, THE LOCOMOTIVES ARE READY TO BEGIN COUPLING OPERATION.

20 TON LOCOMOTIVE FOR SWITCHING AT FT DRUM

OPERATION	C-18-L(RB)	TR	UC-18-L	TR	C-15-L(RB)
TIME (MINUTES)	(18)	(6)	(3)	(6)	(15)
TRACK (LOCATION)	L6	S1	S1	L7	L7
NUMBER OF RAILCARS	18	18	18	0	15

CAP 57' LG	PRIORITY OF USE	TRK NO	NUMBER OF CARS
	LOADING SITES:		
29	FT DRUM SPUR TRACK # 2	L1	29 FLT
27	# 3	L2	27 FLT
26	# 4	L3	26 FLT
26	# 5	L4	26 FLT
36	TRACK # 32(MOD)	L5	36 FLT
18	SPUR TRACK # 31(MOD)	L6	18 FLT
15	# 26(MOD)	L7	15 FLT
18	# 30	L8	4 Box
18	# 29	L9	4 Box
17	# 28	L10	4 Box
17	# 27	L11	3 Box
28	# 19(MOD)	L12	28 FLT
26	# 20 (MOD)	L13	26 FLT
23	FT DRUM SPUR TRACK # 21 (MOD)	L14	23 FLT
	EMPTY STORAGE:		
164	FT DRUM TRACK # 1	E1	134 FLT
160	CONRAIL MAINLINE N. OF CALCIUM SWITCH	E2	0
10	FT DRUM LADDER TRACK # 17	E3	0
16	FT DRUM SPUR TRACK # 24	E4	2 CAB
	LOADED STORAGE:		
22	FT DRUM SPUR TRACK # 22	S1	0
18	FT DRUM SPUR TRACK # 23	S2	0
320	SECTION OF TRACK BETWEEN FT DRUM WYE & CONRAIL MAINLINE WYE (CALCIUM)	S3	0

8 9 10

	TR	C-27-L(RB)	TR	WAIT FOR ADDITIONAL CARS	1ST TRAIN DEPARTS FT DRUM
	(6)	(27)	(9)	(45)	(33)
	L2	L2	S3	S3	WATERTOWN
	29	56	56	71	90

→ 1ST TRAIN ARRIVES WATERTOWN AND DEPARTS FOR POE

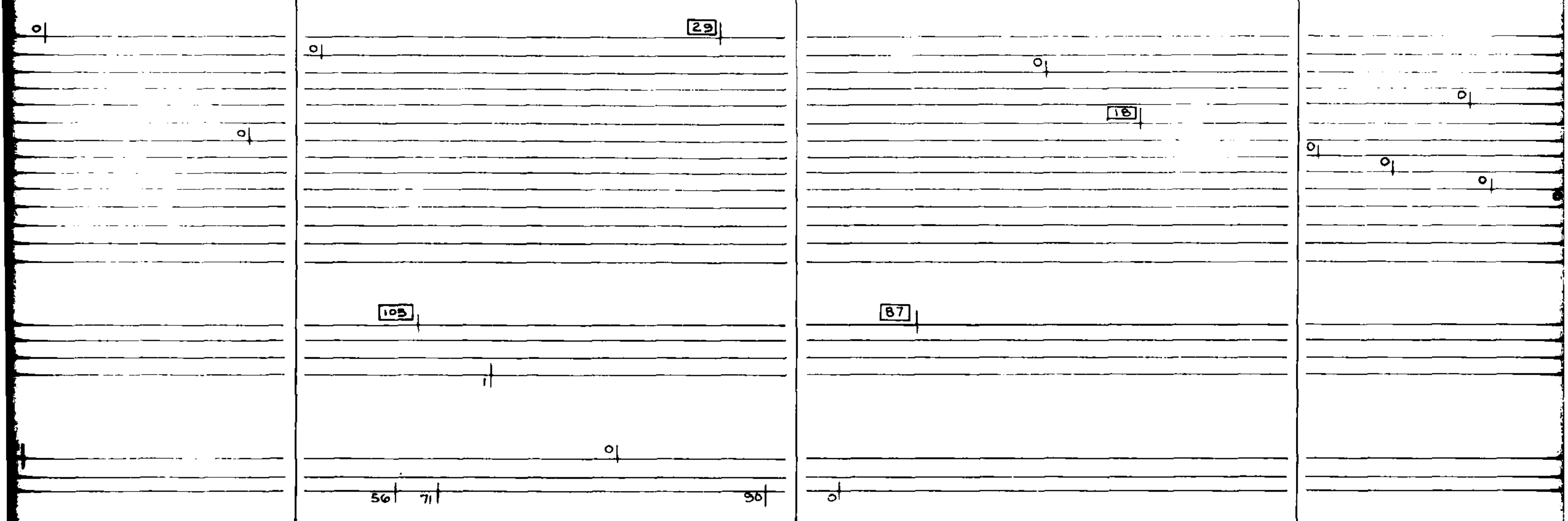
...0-TON LOCOMOTIVES) ...ALLY ON E1 AND ...ING BEFORE ...T LOAD AFTER ...RTS FT DRUM

OPERATION	C-29-E	TR	UC-29-E(SB)	TR	C-26-L(RB)	WT	TR	C-36-L(RB)	TR
TIME (MINUTES)	(12)	(6)	(30)	(6)	(27)	(6)	(12)	(39)	(9)
TRACK (LOCATION)	E1	L1	L1	L3	L3	L3	L5	L5	L12
NUMBER OF RAILCARS	29	29	29	0	26	26	26	62	62

THIRD TRAIN WITH 4 120 TON LOCOMOTIVES, 120 FLTS, 15 BOXCARS AND 1 CABOOSE LEAVES WATERTOWN FOR FT DRUM AFTER FIRST TRAIN ARRIVES AND WAITS NORTH OF CALCIUM (CONRAIL MAIN LINE) SWITCH UNTIL SECOND TRAIN PASSES.

OPERATION
TIME (MINUTES)
TRACK (LOCATION)
NUMBER OF RAILCARS

TR	C-15-L(RB)	WT	TR	UC-C-15-L	TR	[illegible]	TR	C-18-L	TR	UC-C-19-L	TR	C-18-E	TR	UC-18-E(SB)	WT	TR	C-4-L(RB)	TR	C-4-L(RB)	TR	C-4-L(RB)	TR	C-3-L(RB)
(6)	(15)	(6)	(18)	(6)	(3)	(3)	(9)	(6)	(9)	(9)	(9)	(9)	(9)	(18)	(9)	(6)	(6)	(3)	(6)	(6)	[illegible]	(3)	(6)
L7	L7	L7	S3	S3	E4	E4	S1	S1	S3	S3	E1	E1	L6	L6	L6	L8	L8	L9	L9	L10	[illegible]	L11	L11
0	15	15	15	15	0	1	1	19	19	19	0	18	18	18	0	0	4	4	8	8	[illegible]	2	15



2

1

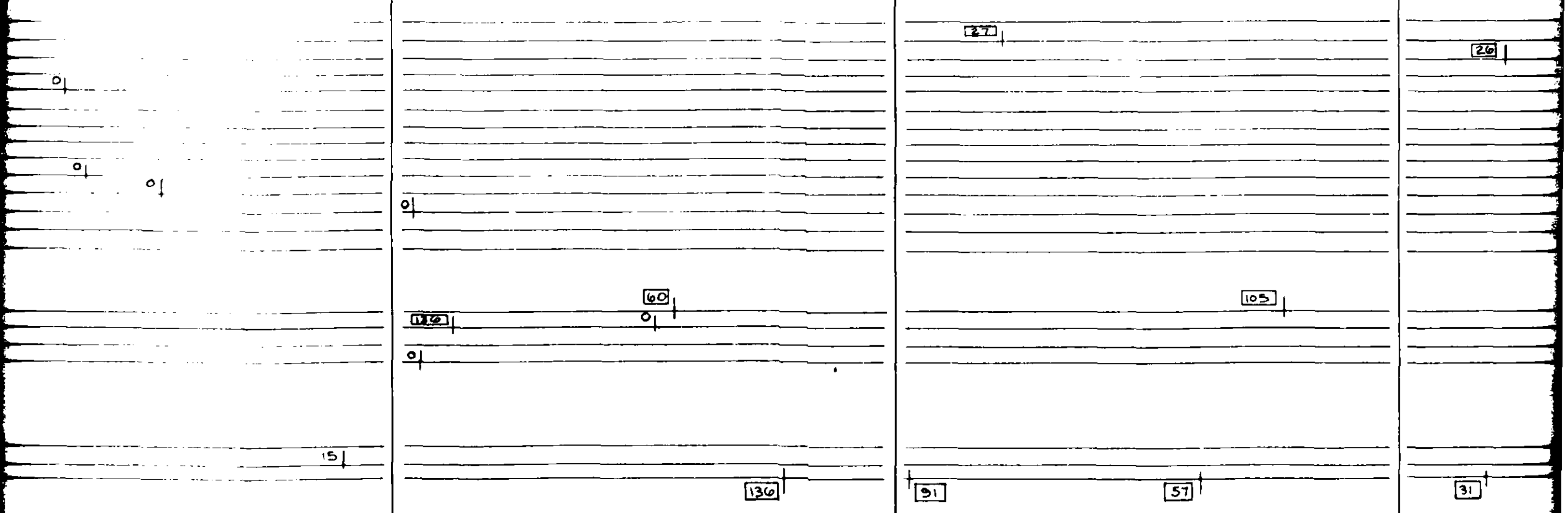
11 12 13

	TR	C-28-(RB)	TR	WT	2ND TRAIN DEPARTS FT DRUM
	(9)	(33)	(3)	(6)	(39)
	[illegible]	L12	WYE	WYE	WATERTOWN
	[illegible]	90	90	91	91

→ 2ND TRAIN ARRIVES WATERTOWN AND DEPARTS FOR POE

OPERATION	TR	WT	TR	UC 45-E	TR	UC 45-E	TR	C-26-E	
TIME (MINUTES)	(36)	(24)	(15)	(15)	(30)	(15)	(9)	(15)	
TRACK (LOCATION)	FT DRUM	E2	S3	S3	L1	E1	S3	S3	
NUMBER OF RAILCARS	136	136	136	91	45	0	0	26	

R	C-4 (RB)	TR	C-3 (RB)	TR	UC-15-L	WT	TR	[illegible]	TR	C UC-1 CABOOSE	TR	C-27-E	TR	UC-27-E (SB)	TR	C-34-E	TR	UC-26-E	TR
)	[illegible]	(3)	(6)	(12)	(9)	(3)	(3)	(3)	(6)	(6)	(6)	(12)	(9)	(30)	(9)	(15)	(27)	(9)	(6)
10	[illegible]	L11	L11	S2	S2	S2	E4	E4	WYE	WYE	E1	E1	L2	L2	S3	S3	L3	L3	E1
	[illegible]	2	15	15	15	0	0	1	1	1	0	27	27	27	0	34	34	8	8



F

3

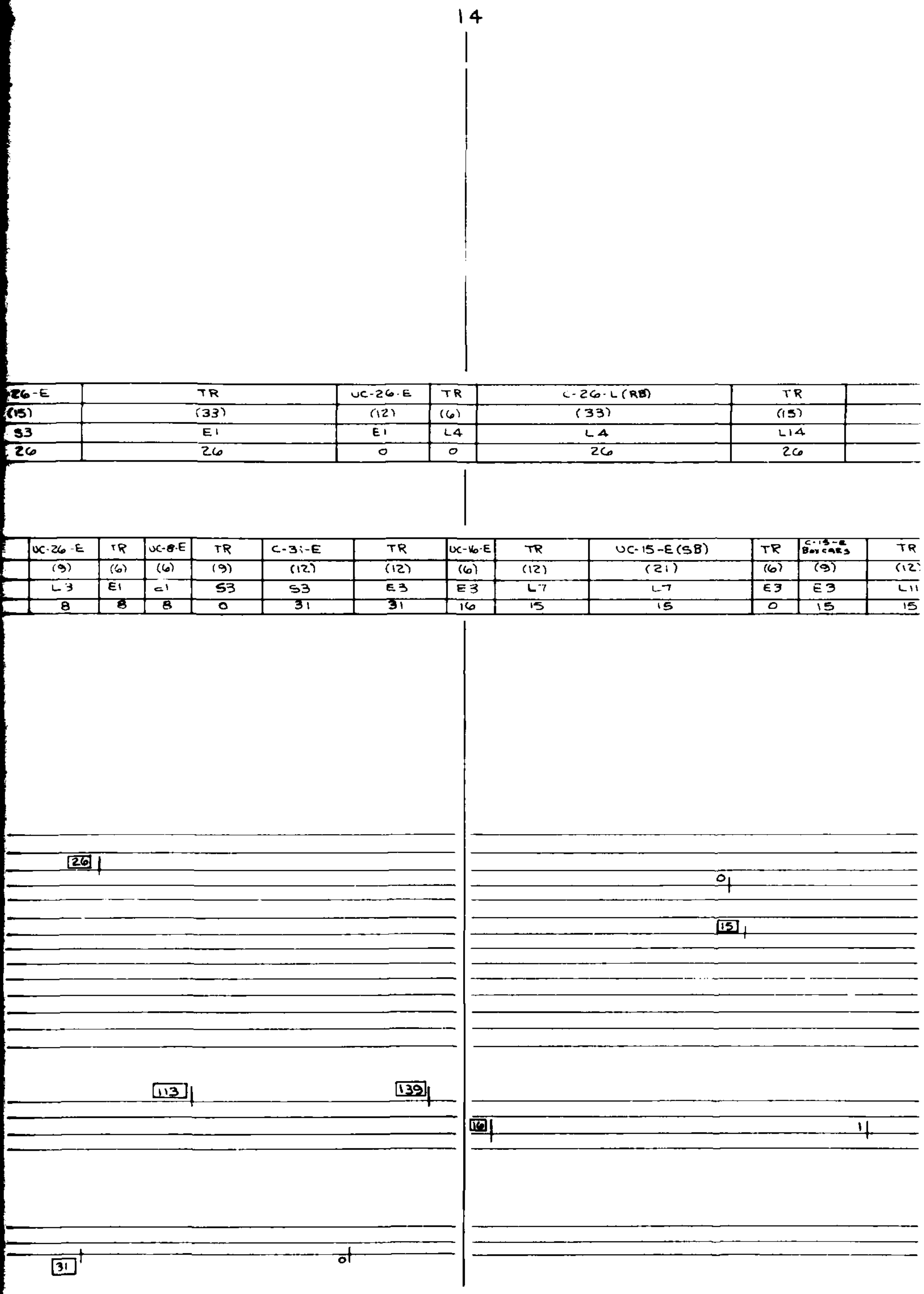


Figure 43. Rail outloading simulation, Fort Drum.

15 16 17

C 23-L (RB)	TR	C-26-L (RB)	TR	C-15-L	WT	3RD TRAIN DEPARTS FT DRUM
(30)	(6)	(30)	(9)	(9)	(15)	(39)
L14	L13	L13	S2	S2	S2	WATERTOWN
49	49	75	75	90	91	91

→ 3RD TRAIN ARRIVES AND DEPARTS FOR

	UC-3-E(SB)	TR	UC-4-E(SB)	TR	UC-4-E(SB)	TR	UC-4-E(SB)	T	C-1-CABOOSE	TR	C-UC-CABOOSE	WT	TR	C-26-E	TR	UC-26-E
	(9)	(6)	(9)	(9)	(9)	(6)	(9)	(9)	(6)	(6)	(6)	(15)	(12)	(12)	(9)	(30)
	L11	L10	L10	L9	L9	L8	L8	E3	E3	S2	S2	S2	E1	E1	L4	L4
	12	12	8	8	4	4	0	0	1	1	0	0	0	26	26	0

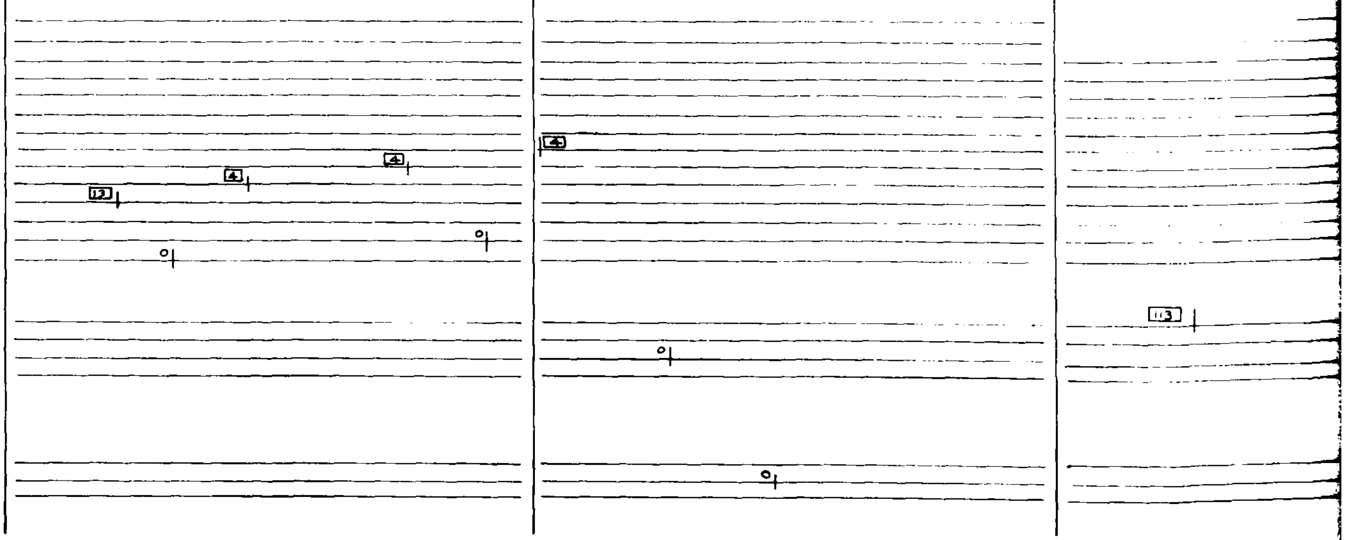


Figure 43. Continued.

18 19 20

3RD TRAIN ARRIVES WATERTOWN
AND DEPARTS FOR POE

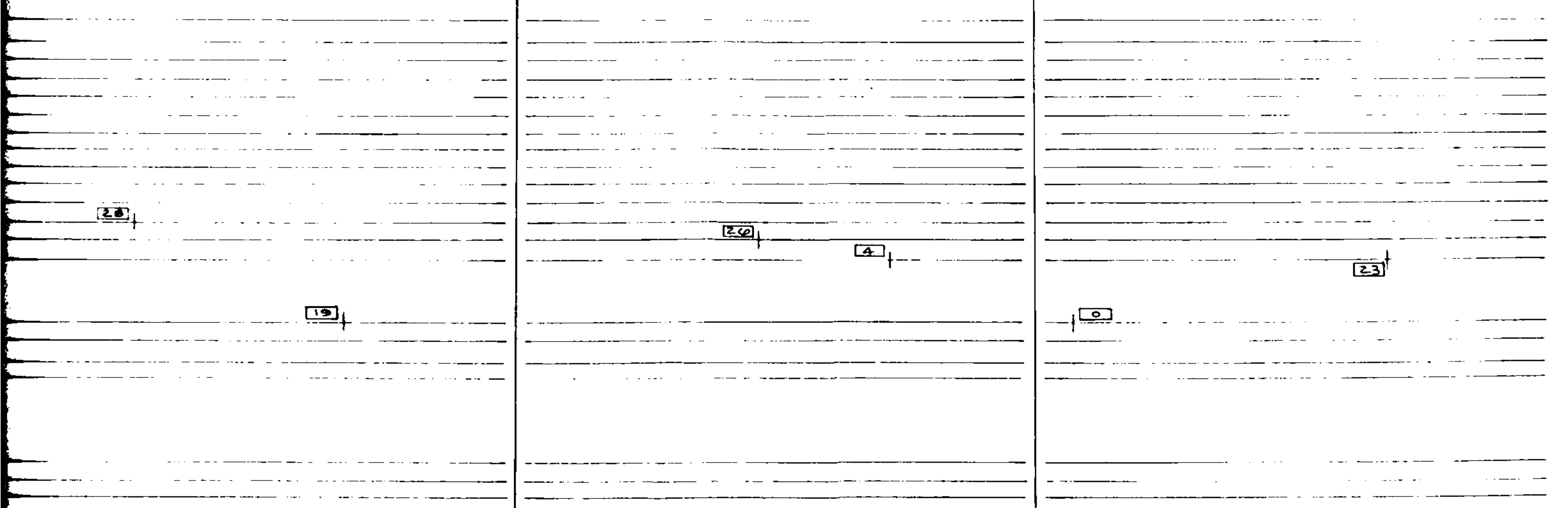
TR	UC-26-E(SB)	TR	C-34-E	TR	UC-34-E(SB)	TR	C-30-E	TR	UC-2E[illegible]	TR	UC-28-E(SB)
(9)	(30)	(6)	(15)	(15)	(36)	(6)	(15)	(15)	(6)	(6)	(30)
L4	L4	E1	E1	L5	L5	E1	E1	L5	L5	L12	L12
26	0	0	34	34	34.	0	30	30	30	28	28

26 34 36

113 79 49

21 22 23

(SB)	TR	C-30-E	TR	UC-26-E(SB)	TR	UC-4-E(SB)	TR	C-19-E	TR	UC-19-E(SB)	TR	SET BRA
	(9)	(15)	(18)	(30)	(6)	(9)	(12)	(9)	(15)	(21)	(9)	(30)
	E1	E1	L13	L13	L14	L14	E1	E1	L14	L14	L3	L3
	0	30	30	26	4	4	0	19	19	23	0	26



23

SET BRAKES
(30)
L3
26

1 4

arrives at Fort Drum. The 134 flatcars are positioned on E1, and the 2 cabooses are spotted on E4.

This first train arrives at Fort Drum and stops at the beginning of the wye. The entire train can be accommodated along the 3. 5-mile track leading into Fort Drum from the wye off the CONRAIL main line. The locomotives then uncouple the cars, by sections, and position the empties. The engines will use Fort Drum ladder tracks 17 and 18 and the far south end of track 2 for reversing. After positioning the empties, the locomotives are ready to begin coupling operations.

The second train, consisting of only four 120-ton locomotives, follows behind the first train and assists in positioning the remaining cars of the first train. The four locomotives then move to E1 to assist in switching prior to coupling their first load.

At the 7th hour, the first train couples 29 loaded cars from track L1 and transits to track L2 to couple 27 loaded cars. The first train then transits through the Fort Drum wye toward the CONRAIL main line wye and stops far enough down the track to allow sufficient track length for an additional 34 cars to be coupled to it.

As the first train begins its coupling operation, the single locomotive initially positioned at Fort Drum, begins switching operations and picks up 18 loaded cars from track L6 and transports them to loaded storage track S1. It then transits to track L7 to pick up 15 loaded cars and transports these cars through the wye and couples them to the first train. The switching locomotive then returns to empty storage track E4 to pick up one caboose. It then moves to track S1 and couples with the 18 loaded cars stored there and transports them and 1 caboose through the wye and couples these cars to the first train, to make a trainload of 90 cars. The first train then departs for the POE (elapsed time--9 hours).

As Fort Drum's rail loading facilities are located at both the northeast leg of the wye (L1 through L4) and the south leg of the wye (L5 through L14), simultaneous coupling and switching can be accomplished with proper coordination and timing. The four locomotives (and their crews) brought in to pull the second trainload are assisting in switching, while the first trainload is being coupled.

With the movement of the first train through the wye to wait for additional cars, the second train's locomotives couple 29 empties from track E1, and position these cars on the just-vacated track L1, and set the brakes for the next day's loading. Then, upon departure of the first train, the second train (with four locomotives) couples 26 loaded cars from track L3,

transits to track L5 to pick up 36 loaded cars, and to track L12 to pick up 28 loaded cars. The second trainload then moves through the Fort Drum wye, stopping for a few minutes to have the caboose attached to the trailing car, after which, the second train of 91 cars departs for the POE (elapsed time--11-1/4 hours). Concurrently, with the formation of the second train, the switching locomotive, without interfering with the second trainload, takes 18 empty cars from track E1 and positions them for loading (with brakes set) on the vacated track L6. This 120-ton locomotive then transits to tracks L8, L9, L10, and L11, respectively, to couple a total of 15 loaded boxcars, and transports them to storage track S2.

Meanwhile, the third train, with four 120-ton locomotives, 120 empty flatcars, 15 empty boxcars, and a caboose, arrives at the CONRAIL wye intersection leading into Fort Drum. The third train moves north of the wye on the main line and waits there until the second train passes through the wye leading toward Watertown, New York. The third train then moves down the track leading into Fort Drum, stopping along the northwest leg (S3) of the Fort Drum wye, just short of the wye.

The trainload of empty cars is then broken up and positioned on empty storage track E1 and at loading sites, where possible. The third train's locomotives, upon completion of positioning the empties, transits to track L4 to couple 26 loaded cars and then transits to track L14 to couple 23 more loaded cars. The third train then moves to track L13 to couple 26 loaded cars and to storage track S2 to couple the 15 loaded boxcars and 1 caboose. The third trainload, now consisting of 91 cars, then departs Fort Drum for the POE (elapsed time--16-1/2 hours).

After coupling the caboose to the second trainload, the switching engine transits to empty storage track E1 to couple 27 empty cars and positions them on track L2 for loading. Then, upon arrival of the third train carrying empty cars, the engine assists in breaking up the train and positioning empty cars on loaded track sites and empty storage track E1. This is done simultaneously with the formation of the third loaded train, mentioned previously. This simultaneous switching and train formation is accomplished by using the different legs of the wye.

The switching engine couples 34 empty cars from the incoming train and positions 26 empty cars on track L3 and 8 empty cars on track E1. It then transits back to the train of empty cars and couples the last 31 empty cars, including 15 boxcars. Fifteen of these empty cars (flatcars) are positioned for loading on track L7, and 15 empty cars (boxcars) are positioned for loading on tracks L8, L9, L10, and L11, respectively. The caboose is temporarily positioned on track E3 and then attached to the third loaded train, just prior to its departure from Fort Drum.

Upon departure of the third train, the switching locomotive transits to track E1 to couple 26 empty cars and positions these cars on track L4 and sets their brakes. The locomotive goes back to track E1 and couples 34 empty cars and positions these cars on track L5 for loading. It returns again to track E1 and picks up 30 empty cars and positions 2 cars on track L5 and 28 cars on track L12.

Thirty more empty cars are taken from track E1, and 26 cars are positioned on track L13 and 4 cars on track L14. The last 19 empty cars on track E1 are coupled and then positioned on track L14. The locomotive's crew then goes to track L3 where it sets the brakes on the 26 empty cars previously placed there. The brakes are set right away on all cars positioned on loading tracks except those on track L3, for which there is insufficient time. The switching operation is completed in 23-1/2 hours elapsed time, with all cars positioned and ready for loading.

It should be noted that an additional locomotive could be used at Fort Drum for switching and would reduce the rail outloading/switching time. However, the proposed procedure outlined in this appendix uses two crews for the one switching engine and represents the maximum utilization of the locomotives and crews. See table 10 for times required for various switching operations and locomotive capability.

AD-A101 759 MILITARY TRAFFIC MANAGEMENT COMMAND TRANSPORTATION EN--ETC F/G 15/5
RAIL AND MOTOR OUTLOADING CAPABILITY STUDY, FORT DRUM, NEW YORK--ETC(U)
JUN 79 T K WONG, J H GRIER
UNCLASSIFIED MTMC-TE-78-4-55 SBIE-AD-E750 080 NL

2 of 2
AD
A101759

END
DATE
FILMED
8-81
DTIC

TABLE 10
TIMES REQUIRED FOR VARIOUS RAILCAR SWITCHING OPERATIONS AND LOCOMOTIVE CAPABILITY

Empty

C-15-E (5 min)
C-30-E (10 min)
C-45-E (15 min)
UC-15-E (1-2 min)
UC-15-E (SB) (15 min)
UC-30-E (SB) (30 min)

SB = Set Brakes
Set brakes if cars are to be left overnight or loaded or on a steep grade.

Loaded

C-15-L (5 min)
C-30-L (10 min)
C-45-L (15 min)
But if cars have been sitting overnight, brakes must be checked
C-15-L (15 min)
C-30-L (30 min) (or 15 min for 2 men)
C-45-L (45 min) (or 15 min for 3 men)
UC-15-L (1-2 min)
UC-15-L (SB) (15 min)
UC-30-L (SB) (30 min)

Note:
Above times are for daylight operations; add 5 minutes for night if brakes have to be set or checked.

TRANSIT SPEED

Average for all switching operations, 5 miles per hour. Engine with no railcars, 10 miles per hour for distances of one-half mile or more, except for night, then add 5 minutes for each transit.

LOCOMOTIVE CAPABILITY

120-ton locomotive-- 1200 tons on 2.5 % grade
Empties--34 cars
Loaded--24 cars
2 M-60 tanks on series 38 car, 9 cars per locomotive
16 cars per locomotive with 1 tank per 57-ft car
2 locomotives--2 times above capabilities

Speed vs Time

@5 miles per hour, time in minutes = .00227 min/ft (distance in feet)
@10 miles per hour, time in minutes = .00114 min/ft (distance in feet)
@26 miles per hour, time in minutes = .000438 min/ft (distance in feet)

APPENDIX C

SPECIAL-PURPOSE RAILCARS AND LOADING/UNLOADING PROCEDURES

Specially designed railcars, in particular those used for transporting vehicles, can greatly increase the speed and efficiency of a rail outloading operation. Bilevel, trilevel, and integral chain tiedown flatcars are the primary means of enhancing the loadout routine of most military vehicles. Bilevel and trilevel railcars are best suited for the smaller vehicles, including 2-1/2-ton trucks.

The integral tiedown flatcars will accommodate larger vehicles, including tanks. Loading and securing equipment on these railcars can be accelerated to 15 minutes per vehicle, for small vehicles, versus approximately 45 minutes for blocking and bracing procedures used on standard-type railcars. Also, the BTTX 89-foot flatcar has a capacity of six 2-1/2-ton trucks, doubling the single level capacity. Thus, in speed and capacity, special-purpose railcars are an advantage worth investigating.

There are essentially five methods of loading/unloading multilevel railcars, they are:

1. The "K" loader of 463L aircraft cargo-loading system.

2. The forklift and pallet used in conjunction with a crane and/or ramp.

3. The crane and ramp combination.

4. Adjustable ramps.

5. Adjustable built-in ramp on multilevel railcars.

The procedures used with each of the above are described in detail in TM 55-625[6/], as are tiedown procedures.

As of 1970, more than 70 percent of DOD installations had no organic capability to load/unload multilevel railcars. No outloading plans should include the use of these railcars until a thorough investigation verifies

---

[6/] TM 55-625, Transportability Criteria and Guidance, Loading and Unloading Multilevel Railcars at Military Installations in the United States.

their availability at the time required. The supply of special-purpose flatcars with integral tiedowns is also limited. As a result, even though these types of railcars are very valuable for volume rail outloading operations, their availability is seriously in question unless advance preparations are made.

The following trends in flatcar supply are now operative and have been since the development of modern piggyback service in the mid-1950's:

1. The size of the flatcar fleet has been growing, both in number of flatcars and in relation to the size of the car fleet as a whole. This gain has been confined to specialized cars; for example, trailer-on-flatcar, container-on-flatcar, bilevel, trilevel, and bulkhead flatcars.

2. The size of the general-purpose flatcar fleet has decreased, though average length and capacity have increased.

3. A majority of all flatcars are owned by car companies, not by the railroads. Therefore, more flexibility in assignment, with improved utilization, has resulted. Fewer idle cars available for short-notice use than would be if each railroad maintained an adequate supply for its own needs.

Considering these trends, the sizes of the various components of the specialized flatcar fleet, and the blocking and bracing requirements for the various types of equipment to be shipped by rail, it does not appear prudent to express an installation's needs and outloading plan using only general-purpose flats. The TOFC fleet, in particular, is now most likely large enough to fill military requirements (table 11). The COFC fleet also has expanded to the point that it could carry most of the military's container movements, especially since COFC cars are used almost exclusively for import/export movements, which likely would be greatly disrupted in a mobilization period.

Accordingly, vans or containers should be outloaded on TOFC cars. If the movement is to a port for ocean shipment by other than RORO vessel, the use of COFC cars should be considered. However, the availability of COFC cars in the quantity desired without disrupting civilian container movements is highly improbable.

Other cars in the specialized flatcar fleet generally are assigned to specific services or to a carpool for one shipper's exclusive use. Therefore, although these cars can save blocking and bracing and should be requested when they can be employed profitably in a specific move, the likelihood of obtaining the cars is too weak to base outloading requirement on their use.

TABLE 11

TRAILER TRAIN COMPANY FLEET

Trailer Train Company ownership of selected car types as contained in the April 1976 Official Railway Equipment Register. Trailer Train owns in excess of 95 percent of total US ownership of TOFC, COFC, and autorack cars.

Type	Reporting Marks	Quantity
TOFC	*TTX	29,661
	TTAX	5,033 (see also COFC cars)
	GTTX	2,287
	LTTX	1,876
	XTTX	733
	Total	39,590

Each car has a capacity of two 40-foot (nominal length) trailers. Some can handle one 40-foot and one 45-foot trailer. The XTTX cars also have the capability of transporting three 28-foot trailers.

Type	Reporting Marks	Quantity
COFC	TTAX	5,033 (see also TOFC cars)
	TTCX	708
	Total	5,741

Each car can handle four 20-foot container equivalents. Note that the TTAX cars can handle either containers or trailers and so are counted in both TOFC and COFC totals.

Type	Reporting Marks	Quantity
Bilevels	TTBX	4,333
	BTTX	2,776
	Total	7,109
Trilevels	TTKX	6,133
	RTTX	3,500
	KTTX	2,685
	TTRX	2,196
	ETTX	796
	Total	15,310

*Definitions of Trailer Train Company reporting marks (all are flatcars)

TTX - Equipped with hitches and bridge plates for the transportation of trailers.
TTAX - Equipped with movable foldaway container pedestals, knockdown hitches and bridge plates for transporting trailers or containers or combinations of both. (A = all).
GTTX - Equipped with hitches and bridge plates for the transportation of trailers built by General American Transportation Corporation. (G = general)
LTTX - Low deck (2' 8" or 2' 9" instead of 3' 6"), equipped with hitches and bridge plates. (L = low)
XTTX - Equipped with four hitches and bridge plates for the transportation of two trailers; one 45-foot and one 40-foot or three 28-foot trailers.
TTCX - Equipped with movable foldaway container pedestals for transporting containers. (C = container)
BTTX - Equipped with bilevel autoracks furnished by member railroads. (B = bilevel)
TTBX - Length 89' 4" or over, equipped with bilevel autoracks furnished by member railroads. (B = bilevel)
TTKX - Length 89' 4" or over, equipped with hinged-end trilevel autoracks furnished by member railroads.
RTTX - Length 89' 4" or over, equipped with fixed trilevel autoracks furnished by member railroads.
KTTX - Equipped with hinged-end trilevel autoracks furnished by member railroads.
TTRX - Equipped with fixed trilevel autoracks furnished by member railroads.
ETTX - Equipped with fully enclosed trilevel autoracks furnished by member railroads. (E = enclosed).

Factors affecting the use of specialized flatcars include:

1. First priority for use of general-purpose flats should be to load tracked vehicles and nonstandard wheeled vehicles; for example, artillery.

2. First priority for requesting specialized flats should be for TOFC and COFC cars to load vans and containers, which require very extensive blocking and bracing to move on general-purpose cars.

3. TOFC and COFC cars require no blocking and bracing.

4. Bilevel and trilevel flats will require heavier chains and possibly different hooks to handle other than commercial specification vehicles.

5. Chain tiedown flats may require heavier chains, depending on the loads for which they were designed.

6. Where TOFC cars must be loaded using a ramp rather than side or overhead loading, the number of cars at a ramp should be limited to about 10 because of the delay involved in backing the trailers down the length of the cars and returning with the tractor.

7. Where sufficient suitable aprons and MHE are available, it may be desirable to load containers directly onto COFC cars rather than to place them on bogies and use TOFC cars.

8. If COFC or TOFC cars are not available, some blocking and bracing time and expense can be saved by using bulkhead flatcars to carry containers.

9. Bilevel and trilevel cars require, obviously, bilevel and trilevel ramps or other equipment as indicated in TM 55-625.

10. TOFC, COFC, bilevel, and trilevel cars average 89 feet long. TOFC cars can handle two 40-foot trailers or one 40-foot and one 45-foot trailer. COFC cars can handle four 20-foot container equivalents. Autorack cars can accommodate four to seven vehicles per deck, depending on vehicle length and the number of tiedown chain sets.

11. Tracks used to store or load cars over 65 feet long should be reachable without going through curves exceeding 10-degree curvature, and tracks used for cars between 55 and 65 feet should be reachable without going through curves exceeding 12-degree curvature.

APPENDIX D

DEPARTMENT OF TRANSPORTATION — FEDERAL RAILROAD ADMINISTRATION, FORT DRUM TRACK INSPECTION REPORT

C
O
P
Y

Edward B. Hassel
Director of Railroad Safety

October 19, 1978

A. H. MacDowell
Track Safety Inspector

Inspection of Track Facilities,
United States Army, Fort Drum,
Watertown, New York

On August 15 and 16, 1978, a walking inspection of all trackage located inside the Fort Drum Army Complex was conducted. The results of this inspection, including pertinent observations and recommendations, are herewith submitted.

As requested by Mr. Mark Tillitson, Post Commander, all trackage was inspected for compliance with FRA Class #2 standards although present speeds do not exceed the maximum allowable for FRA Class #1 track.

In attendance during the 2 day inspection were the following representatives of the Directorate of Facilities Engineering, Fort Drum:

(a) Alan D. Simmons, Engineer Draftsman
8/15 and 8/16/78
(b) Clinton R. Smith, Engineer Equipment
Operator Foreman - 8/15/78 only

The subject report will be divided into 4 specific areas of trackage within the complex as follows:

(1) Main lead into Fort Drum from Conrail's Massena Secondary track east to and including wye track dividing "Zero Area" and "Gasoline Alley."
(2) "Zero Area" from wye track south to end of track including all storage tracks.
(3) "Gasoline Alley" from wye track east to end of track including the "Pool Yard."
(4) Lead into Fort Drum "Munition Storage Area" from Conrail's Newton Falls Branch.

C
O
P
Y

Area #1 - Main lead into Fort Drum

Inspection of this trackage revealed the following deviations from the Federal Track Safety Standards:

(1) Improper fit between switch point and stock rail - switch point open 5/16", switch from main to siding east of Calcium Road x-ing.
(2) Broken base rail, 4" in length (cracked-out) north rail, 300'± east of farm x-ing.
(3) Deviation from zero cross level measures 2-1/4" north rail, west of Route #342 x-ing.
(4) Deviation from uniform alignment on curved track measures 8" (sun kink) - reverse curve, west of Pearl Street x-ing.
(5) Gage on tangent track measures 55-1/2" (rail bent by equipment during snow removal) east of Pearl Street x-ing.
(6) Improper fit between switch point and stock rail (switch stand damaged by equipment during snow removal) New Jersey National Guard x-ing, south leg of wye.
(7) Deviation from uniform alignment on curved track measures 7" (sun kink) - east leg of wye.
(8) Gage on curved track measures 55-5/8" (ties skewed, excessive longitudinal rail movement) connection track between east and south leg of wye.

Other than the above mentioned deviations, this area of trackage meets the Federal Track Safety Standards for Class #2 track. The rail section in this area is 105#, including all switch material, which is in good condition. All crossties are plated, curves are double-spiked and rails are fastened with six-hole joint bars which are fully bolted.

The ballast section is cinder in this area and was noticeably weak in both the shoulder and crib areas at many locations. Deviations #4 and #7 mentioned above occurred when the track was disturbed by recent crosstie removal and the remaining ballast was not sufficient to restrain the track structure laterally. Some thought should also be given to the installation of rail anchors, especially on new crossties, in order to effectively control longitudinal rail movement which was noticed to be excessive at several locations.

C
O
P
Y

Area #2 - "Zero Area"

Inspection of this trackage revealed the following deviations from the Federal Track Safety Standards:

(1) 4 locations, no bolts in one end of rail (pull-apart) - running track west side of storage yard.
(2) Vertical split head rail (6" broken-out) and broken base rail (6" broken-out) same rail, north end of running track.
(3) No bolts in one end of rail (pull-apart) stub end track between Oswego and Warehouse Roads.
(4) Broken rail, straight break from head to base, stub end track between Ordinance and Oswego Roads.
(5) All switches on south end ladder for storage yard, all switches leading to stub end tracks and switches located on the south end of running track (16 switches total), all need switch timber renewal in order to comply with FRA Class #2 crosstie requirements.
(6) All storage yard tracks (7 tracks total) need crosstie renewal in order to comply with FRA Class #2 crosstie requirements.

The rail section in this area is also 105#, including all switch material, which is in good condition. All crossties are plated and the ballast section is cinder. It was evident during the inspection of this area, that its usage has been minimal in recent years. Considerable crosstie and switch timber renewal (south ladder only) must be accomplished before FRA Class #2 crosstie requirements can be satisfied.

Area #3 - "Gasoline Alley"

Inspection of this trackage revealed the following deviation from the Federal Track Safety Standards:

(1) 5 locations, distance between non-defective crossties exceeds 100" (heavy equipment has broken crosstie ends) - main track, east of "Pool Yard" x-ing.
(2) No bolts in one end of rail (pull-apart) - south rail, west of 8th Street West x-ing.

C
O
P
Y

(3) Improper fit between switch point and stock rail - switch point open 5/16", 1st switch west of 8th Street East x-ing.
(4) 178" between non-defective crossties (switch timber under frog area) - 1st switch west of 8th Street East x-ing.
(5) All "Pool Yard" tracks (5 tracks total) need crosstie renewal in order to comply with FRA Class #2 crosstie requirements.

The rail section in this area is also 105#, including all switch material, which is in good condition. All crossties are plated with the exception of the "Pool Yard" tracks and the ballast section is again cinder.

Since switches require continual maintenance, it is recommended that the 8 switches presently not in use on "Gasoline Alley" (side tracks removed for the installation of underground storage tanks), be physically removed and the material stockpiled as this material is compatible with others used in the Fort Drum Army Complex.

Area #4 - Lead into "Munition Storage Area"

Inspection of this trackage revealed the following deviations from the Federal Track Safety Standards:
(1) 216" between non-defective crossties (switch timber under frog area) - switch leading into "Munition Storage Area" from siding.
(2) No bolts in one end of rail (pull-apart) - east of gate.

The rail section in this area is 80#, some crossties are plated and the ballast section is again cinder. The last quarter mile of this track was covered with heavy vegetation and is evidently not being used at this time, as cars are being unloaded at a special platform.

In conclusion, the following recommendations are also suggested:

(1) All tracks to be inspected on a monthly basis during seasonal usage.

C
O
P
Y

(2) All switches to be lubricated and checked for adjustment on a monthly basis during seasonal usage.

Track Safety Inspector

cc:

Headquarters, Fort Drum
Watertown, New York 13601
Attn: AFZS-FE-13

Headquarters
United States Armed Forces Command
(FORSCOM)
Fort McPherson, Georgia 30330
Attn: AFEN-FEB

DISTRIBUTION

Commander Fort Drum Watertown, NY 13601	(2)
Commander Fort Drum ATTN: AFZS-DI-T (Trans Ofc) Fort Drum, NY 13601	(25)
Chief, Army National Guard Bureau Room 2D424 Pentagon ATTN: NGB-ARL-T WASH, DC 20315	(4)
Commander US Army Forces Command ATTN: AFLG-TRU (2); AFEN-FEB (1); AFEN-ME (1) Fort McPherson, GA 30330	(4)
Commander US Army Readiness Region I ATTN: Transportation Readiness Coordinator Fort Devens, MA 01433	(2)
Commander US Army Readiness Command ATTN: J4 MacDill Air Force Base Tampa, FL 33608	(4)
HQDA DALO-TSM-P Room 1D616 Pentagon WASH, DC 20310	(1)
USA TSARCOM Systems Analysis Office ATTN: DRSTS-FR 4300 Goodfellow Boulevard St. Louis, MO 63120	(1)
Army Materiel Systems Analysis Activity ATTN: DRXSY-CL Aberdeen Proving Ground, MD 21005	(1)

Commander
Military Traffic Management Command
ATTN: MT-SA (2); MT-PLM (2)
WASH, DC 20315 (4)

Commander
Military Traffic Management Command, Eastern Area
Bayonne, NJ 07002 (6)

Commander
Military Traffic Management Command, Western Area
Oakland Army Base
Oakland, CA 94626 (2)

Commandant
US Army Transportation School
ATTN: Transportation Library
Fort Eustis, VA 23604 (1)

Director
Military Traffic Management Command
Transportation Engineering Agency
Newport News, VA 23606 (10)

2516-79